# THE ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER
ESTABLISHED 1872

Volume CXXVI. No. 3242

Friday, January 12th, 1940


## Contents


| | Page |
|---|---|
| Editorial—Development in Wartime | 31 |
| Provender Mill Plant | 33 |
| Electroformed Moulds | 34 |
| Vector Diagrams. By D. Robertson, D.Sc. | 35 |
| High-voltage Transmission in Holland | 36 |
| An Electrified Village | 37 |
| Wholesale Distribution. By J. Whitehead | 38 |
| Pointers to Progress | 39 |
| Manufacturers' Activities | 40 |
| New Sheet Insulating Material. By Dr. H. A. Harrison | 41 |
| Institution Papers | 42 |
| Personal | 43 |
| Correspondence | 44 |
| New Electrical Products | 45 |
| Prospects in Madras | 47 |
| Shock Therapy | 47 |
| Commercial and Industrial | 48 |
| Electricity Supply | 51 |
| Traction | 52 |
| Communications | 52 |
| New Patents | 53 |
| Financial Section | 54 |
| Contract Information | 57 |
| Forthcoming Events | 57 |

| | |
|---|---|
| Classified Advertisements (Official Notices, Situations Vacant, etc.) | 47 |
| Index to Advertisers | 66 |
| Index to Advertisers' Products | 70 |



EDITORIAL, ADVERTISING AND PUBLISHING OFFICES: Dorset House, Stamford Street, London, S.E.1

Telegraphic Address: "Ageekay, Sedist, London." Code, A.B.C. Telephone No.: Waterloo 3333 (50 lines)
Subscription Rates, Postage free: United Kingdom, £1 14s. 8d. Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum
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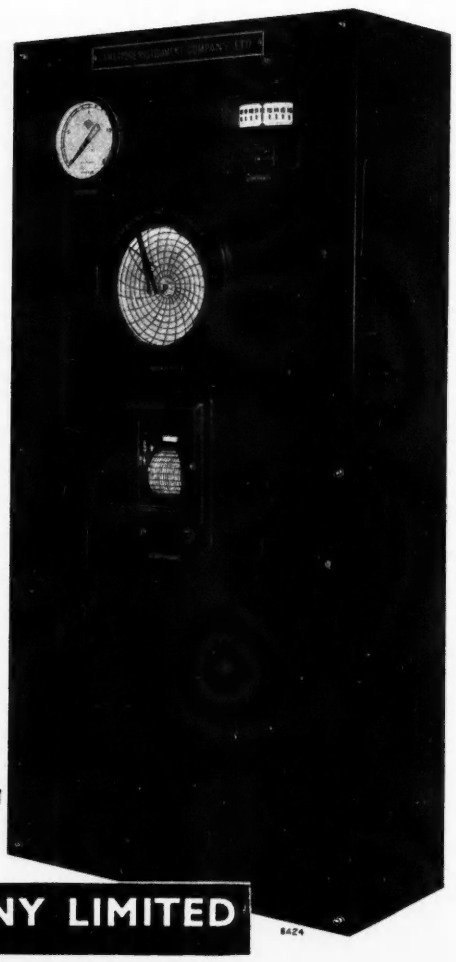

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THE
# ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXXVI. No. 3242 JANUARY 12, 1940 Price SIXPENCE

# Development in Wartime

## E.D.A. Today and Tomorrow

THE British Electrical Development Association was called into being about twenty years ago largely as the result of the situation arising out of the last war. Wartime industrial needs had caused a considerable expansion of generating plant which the post-war slump left on the hands of the supply authorities. Parallel with this there was a substantial growth in electrical manufacturing facilities which also became underemployed when the wartime demand ceased.

It was, therefore, essential to find a load to compensate for that which disappeared when the Armistice was signed. Farseeing electrical men, headed by Mr. J. W. Beauchamp, were convinced that only a strong co-operative effort would have any appreciable effect and E.D.A. was established by the joint action of the supply authorities, manufacturers and contractors. Whatever criticisms may be levelled at the Association it is beyond question that the present strong position of the electrical industry is due to a very great extent to the work of Mr. Beauchamp, his successors and their staff.

### Propaganda and Technical Services

Publicity in many forms has been E.D.A.'s principal activity, but present conditions seem to leave little room for any but one type of propaganda. It might, therefore, be suggested that there is little justification for the Association's existence in wartime. In point of fact members are still availing themselves of the publicity services almost as much as ever—the demand even continues for the window displays; further films have been produced and will soon be generally available.

But even if all electrical publicity ceased and if publicity were E.D.A.'s only reason for being there would still be a case for keeping the Association going. When this war ends a position similar (though probably not so acute) to that which existed in 1918 and onwards is bound to arise. It cannot be suggested that then we should start all over again, and consequently the Association must be ready immediately to commence on an even greater scale the activities which the war has naturally slowed down or brought to a halt.

But E.D.A. has a greater role than that of beating the big electrical drum. During the last few years it has built up a very fine technical service which perhaps as much as its advertising had made it essential to the industry. While the domestic consumer is impressed by pure publicity, industrial and commercial users call for cold facts and figures before they embark upon the conversion of their existing methods. Hence the need for experts in the many branches of electrical application to talk to these "prospects" in their own language and produce "watertight" arguments backed up by something more than mere enthusiasm. This is a service which is of even greater value in war than in peace for it means improved efficiency in production.

### The Immediate Scope

There are at least three directions in which this aspect predominates at the moment—rural electrification, transport and lighting. With regard to the first, the need for rapidly increased production, coupled with a shortage of agricultural labour, calls for improved methods.

This is recognised by the Electricity Commissioners who have raised the restrictions on capital expenditure by supply authorities so far as rural extensions are concerned. In this sphere the Association is able to render valuable assistance and is doing so to an increasing degree.

The present necessity to conserve oil supplies brings electrical transport into prominence. The Electric Vehicle Association has actively presented the case for the trolley-bus in urban transport as a desirable alternative to the petrol bus although the gas-producer vehicle has received more public attention lately on account of its comparative novelty. The trolley-bus, however, will go ahead after the war and money spent in this way is not merely a wartime measure. There is an even stronger case for the battery vehicle for delivery work in urban areas and E.D.A. has the task of educating tradespeople to its value well in hand. In conjunction with the Electric Vehicle Association a spring campaign is to be waged in the course of which attention will be directed particularly to advertising in appropriate trade papers.

Factory lighting is another subject which the Association is actively pursuing. It has in hand a very useful manual which will be circulated to about 30,000 industrial establishments. Here again this

is a matter of importance at any time—war or no war. Yet another useful wartime service which E.D.A. is rendering to its members is the "translation" or interpretation of the multitude of Orders issued by various Government Departments. Anyone who has wrestled with these exercises in involved language will appreciate the need for this felt by busy men. These Orders cover a wide field and many which on the face of things do not concern the electricity supply industry touch it at some point or other. Most members of the Association are fully aware of the continued value of its services to them and consider that they are getting their money's worth. There may be others who are not so certain and it is to these we address the foregoing remarks. It is essential that funds shall continue to be forthcoming, both for current expenditure and also for the building up, if possible, of a reserve which will enable E.D.A. to start the peace with renewed vigor.

**Keeping Up to Date**

IN our Correspondence section this week Mr. H. C. MacEwan draws attention to two points of procedure in connection with the Regulations for the Electrical Equipment of Ships. His suggestion that the Institution of Electrical Engineers should issue each year, for the comment of interested parties, a draft of any modifications found desirable appears to have much to recommend it. The practice might well be extended to the Regulations for the Electrical Equipment of Buildings as a means of giving full official approval to new methods and materials which while up to I.E.E. standards of safety have not yet found their way into the latest complete edition. At present their use is permissible when specified by a competent person, but an installation incorporating them may not be described as complying with the Regulations. This saving clause, however necessary, detracts from the authority of the Regulations as the criterion of sound practice.

**Hard on Wardens**

FOR lighting and heating of wardens' posts at Enfield paraffin lamps are used. It has, however, been decided to equip 36 of the posts with electricity, but because the cost in the case of the remaining 30 posts does not come within the prescribed maximum of £8 16s. 6d. they cannot be converted. This gave rise to some outspoken comments at a meeting of the Urban District Council last week, when it was stated that the conditions in the posts were "appalling," and that the wardens' clothes when they left reeked with paraffin. After some discussion it was decided that a deputation should be sent to the Home Office to urge that the Council should be allowed to install electricity. The extra outlay in providing comfort for these men, who are serving the country, would be well spent, and would mostly go in wages to a section of industry in which there is at present a good deal of unemployment.

**Individual Drives**

IN new factories for the production of armaments there is a strong tendency, manufacturers inform us, to incorporate the electrical equipment as part of the machine tool, with a pronounced leaning towards automatic contactor control. The practice should promote the safety of the operator as well as of the machine tool. This is, of course, merely a logical extension of the principle of individual drive, which is being increasingly adopted in engineering workshops generally. Its importance from the electrical standpoint is that it emphasises an advantage that, in smaller applications, is peculiar to the electrical drive. Even for mills that are operated as a unit, the merits of the individual drive have come to be appreciated and in the textile trade it is being employed for new mills and for extensions. When changing over from steam to electricity, however, consideration has to be given to the capital expenditure that would be incurred on individual drives when power is already transmitted through ropes or belting, but much may be done to eliminate shafting by splitting up the drive into smaller units.

**Electrical Instruments**

THE exhibition of electrical instruments organised each New Year by the Physical Society will not be held this month as has been customary for so long. To compensate in a modest way for the absence of this annual opportunity of gauging progress made in the construction of measuring and recording devices, we are proceeding with the survey of this section of the industry which we have been in the habit of undertaking at this season of the year. There may not have been any spectacular developments or exciting innovations to record during the twelve months just ended, but fresh means and methods are constantly being contrived, providing scope for specially commissioned articles to be contributed to the January 26th issue by acknowledged authorities on their respective subjects. In addition, we hope to include a commentary on how electricity meter testing is likely to be affected by war-emergency limitations and modifications. What may be termed "special power" metering will also be discussed in view of the growing need to cater for industrial consumers whose requirements are complicated by war-time adaptations and specialised activities. This Instrument Number will thus serve the dual purpose of pointing out specialists' views and preferences as well as helping to direct attention to the achievements and improvements of instrument makers during the past year or so.

**Restricted Street Lighting**

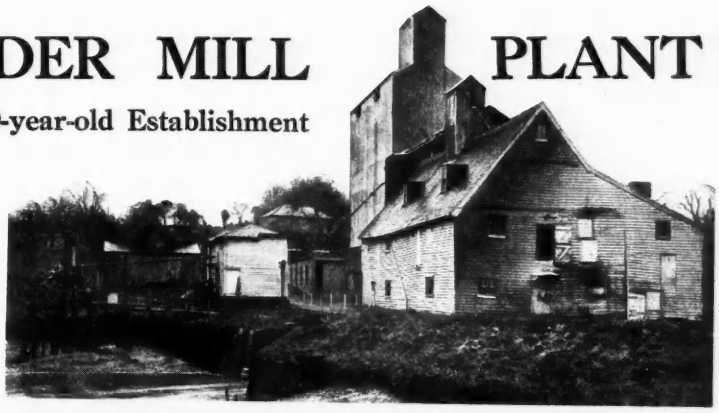
THERE have been complaints from some local authorities that they are unable to secure supplies of the new street lighting fitting conforming to BS/ARP 37. We are told that there has been some delay in the granting of approval to the various designs which have been produced. It is necessary before the fittings can be marketed for the B.S.I. to certify that they conform to the specification and on account of the very low intensities involved, 0.0002 to 0.0004 ft.-candle, testing is not so simple as in the case of ordinary lighting fittings. Every effort is being made to expedite matters and it is anticipated that supplies will be available in a very short while. In view of the probable introduction of summer time much earlier this year it is to be hoped that the delay will be as small as possible lest street-lighting authorities consider that next autumn will be soon enough to consider installing the equipment.

**American Wiring Methods**

IN our issue of December 15th Mr. H. R. Taunton reviewed some proposals by the Edison Electric Institute for the revision of the National Electrical Code. The principal ones were the permitting of a bare neutral in conduit for AC supplies; the use of thin-wall insulation to enable more wires to be got into a conduit; and the use of concentric cables with a lightly insulated, braided outer to form a metallic sheath for surface extensions. The Electrical Committee of the National Fire Protection Association has now approved the use of thin-wall insulation to such an extent that the "conduit fill" (i.e., the proportion of the cross-sectional area occupied by the wires) is increased by about 25 per cent. The bare and covered neutral proposals, however, were not accepted so that the use of covered neutrals is still confined to AC systems not exceeding 150 V to earth where there is at least one earth at the supply company's transformer or elsewhere, in addition to the earth at the main service of the building concerned. There were several advocates of a similar system at last year's E.C.A. Conference but Mr. T. C. Gilbert opposed the idea as he has since done in our columns; he, at least, will approve the decision of the N.F.P.A. Electrical Committee.

# PROVENDER MILL PLANT

## Conversion of a 600-year-old Establishment

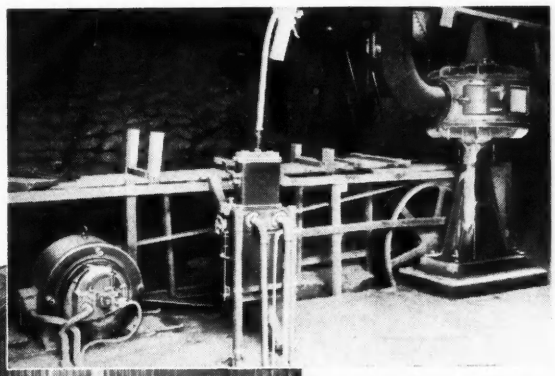


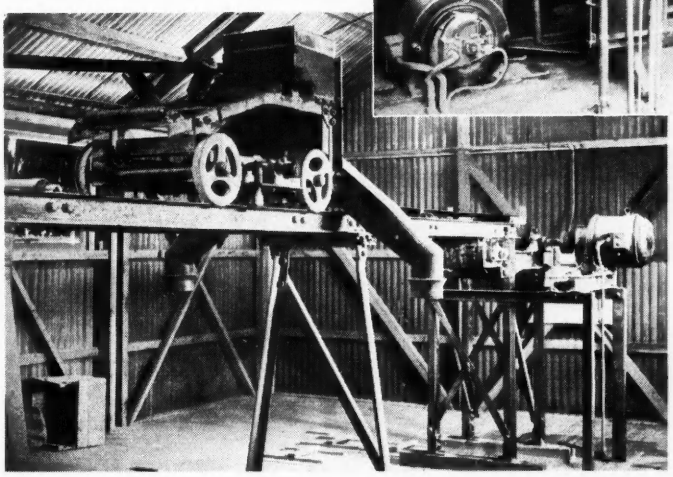
**The Fingringhoe mills are situated on a branch of the river Colne; note grain suction line on river bank**

ONE of the most interesting stories we have ever heard relating to the conversion of flour and forage mills, indeed to any type of installation, is that concerning the provender mills at Fingringhoe, Essex, which we visited recently by the courtesy of C. Hitchcock, Ltd. Mr. Hitchcock told us that, so far as he can ascertain from his records, the mill dates back to 1400, when it was a tidal mill driven by a breast water wheel. This meant that the mill could only be worked when the tide was ebbing, which necessitated a room in which the attendant could sleep, so that the miller could get up and start the stones at, say, 2 a.m., when the tide changed, or, on the other hand, so that he could retire to bed at 2 a.m.

This arrangement continued more or less up to about 1860, when steam power was added, enabling the mill to run continuously and the water wheel to be used merely as auxiliary power at convenient times. In 1893 Messrs. Chopping built a brick addition to the mill and put in roller plant for the production of flour. This enlarged mill operated in the way indicated until 1933, when it was purchased by Messrs. Hitchcock. Then a 6,000-quarter silo was added, and the mill converted into a provender mill for the manufacture of flaked maize and other maize products.

At the same time, plant for the production of Sussex ground oats was added and 550-HP of crude oil engines were installed. In 1938 misfortune in the form of a fire resulted in the total destruction of the silo and the engines. Upon rebuilding the silo it was decided to abandon the Diesels and take a supply of electricity for the whole of the plant.





**A travelling grain band incorporates a special movable hopper for feeding the bins. Left: Grain is removed from the barge by a 35-HP motor-driven suction plant**

The mills are situated on a branch of the river Colne, about five miles from Colchester, and all the grain used is brought by sailing barges direct from ships in the Port of London. The grain is taken from the barge by suction plant, which is driven by a 35-HP totally-enclosed motor. All the motors throughout the mill are totally enclosed, and Mr. Hitchcock regards this as absolutely essential for a provender mill. The suction plant has a capacity of 20 tons per hour and is at present belt driven, but it is about to be converted to rope driving as a means of reducing belt slip and consequently power consumption to a minimum.

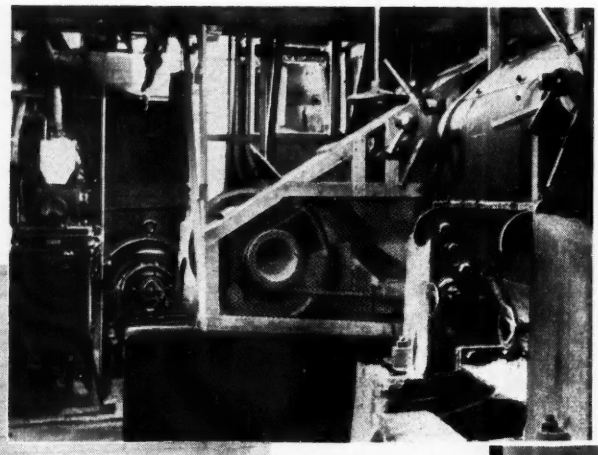
From the silo, into which it is delivered by the suction plant, the grain is drawn out on to a travelling band from the various bins as required and is passed on into the mill for processing. This travelling band incorporates a special feeding hopper which travels on wheels along rails on the conveyor structure, and it incorporates a system of jockey pulleys through which the main conveyor belt is passed, thus providing for movement of the hopper unit to the position required for feeding any of the sixteen bins of the silo. The 2-HP motor on the extreme end of the conveyor structure drives the band through gearing.

Maize flaking is the principal process of the mill, the flakes being suitable for feeding any class of animal. The maize is first treated with water to give it a certain moisture content, and then it is passed into a vertical cylinder into which high-pressure steam is introduced, the maize passing in at the top and the flakes out at the bottom at the will of the operator. After passing on to steam-heated rolls, which dry and flake the maize, the flakes are conveyed by an endless band to air ducts, where they are blown into a cyclone, from which they emerge as dry, crisp pieces of maize for packing in bags ready for the cattle. The sets of rolls each absorb about 25 HP, and in each case transmission is by V-belt. The hot air is introduced by direct-coupled motor-driven fans.

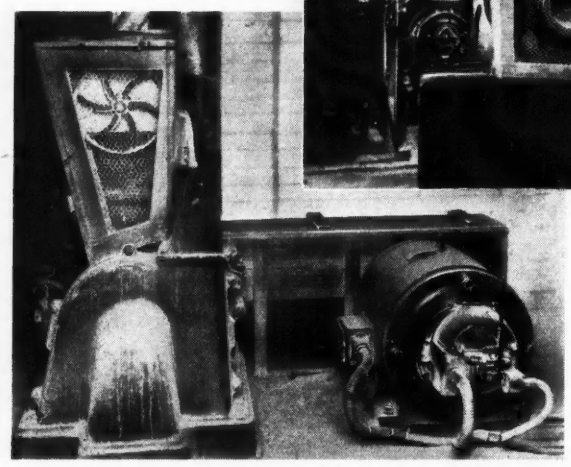
For a form of poultry food maize is passed into a cylinder in which it comes into contact with knives travelling at 1,200 RPM and is thereby cut into pieces. The knives are driven by a directly coupled 10-HP motor. This cut maize is passed on to aspirators, which take out all the light "bees-wing" from it, together with the accumulated dust. A Christy disintegrator is used for converting maize into meal, and this is driven by a 30-HP motor with V-belt transmission.

Although the stone grinding process has been superseded by rolls for flour, this is not the case for what is known as Sussex ground oats. The chicken is peculiar in that it thrives as much on the husk of the oat as on the kernel, provided the husk is ground fine enough for the gizzard to deal with it. The most satisfactory means of treating the husk for this result is by means of the old-fashioned stones, but not in quite the same

manner as is employed for flour. The oat stones are made of emery and revolve at about 500 RPM. The husk of the oat is very tough and the power required for this process in proportion to the output and in relation to the power required for flour milling is very large. An oat stone of 3-ft. in diameter requires a 40-HP motor, whereas a similar stone for flour milling would need only, say, 10 HP. The ground oats are conveyed by elevators to centrifugal separators with roller cages of very fine steel gauze. The coarse rejects are returned to the stone for regrinding, the meal being conveyed along to another centrifugal separator and then through worm conveyors which carry it along to the packers.



**Throughout the mill the driving motors are accommodated in the limited available space ; examples are the 80-HP motor driving two "Dreadnought" mills and 30-HP motor driving flaking rolls**

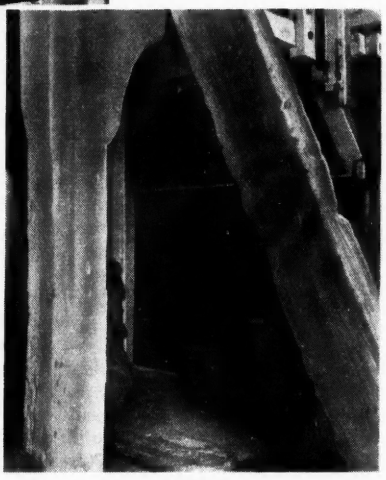


**A Christy disintegrator is used for converting maize into meal ; 30-HP motor**

A word with the miller on the relative merits of oil engines and electric driving was most convincing. He pointed to the now absent difficulties of starting up the oil engines on cold mornings, and to the advantage of electric driving in not having to stop the whole mill in the event of power transmission trouble which affected only a section of the mill at one time. He also stressed the outstanding advantage of direct and V-belt drives by virtue of their immunity from "invisible" slip as compared with the comparatively large and serious slip of belt-driven machines owing to the inevitable gradual collection of dust on the belt in such mills.

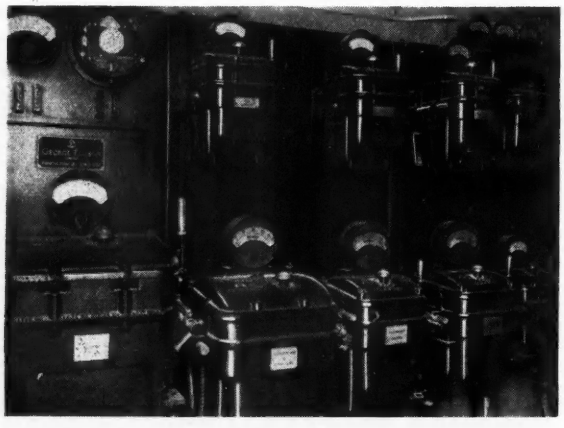
A considerable saving in running costs (machine time) is one advantage, but a more important point is probably the ability to maintain the designed speed of the machine. Totalling 320 HP, the twenty-two motors in the mill vary in capacity from 80 to 1 HP and the normal output of the mill is about four tons per hour.

A feature of the whole conversion scheme is the manner in which the comparatively large motors are packed into the small space available. All the motors are of Crompton Parkinson manufacture, and most of the starters were made by Allen West, Ltd. W. S. Barron & Sons, Ltd., were responsible for the complete electrical installation. Supply is received at 11,000 V from the Colchester Corporation undertaking and transformed on site to 400 V, at which pressure it is distributed by a switchboard composed of Ellison industrial-type oil circuit-breakers. Callender's cables are used throughout the mill.



**Section of the original wood mill and the old water wheel**

Our thanks are due to Mr. Hitchcock for his permission to visit the mill and his help in the preparation of this article.



**Ellison industrial oil switches constitute the main distribution boards**

## Electroformed Moulds

A PROCESS for forming moulds and dies electrically is described in the *Electrical World*. It has been devised by the United States Rubber Company and is particularly applicable where designs are ornamental or where a multiplicity of dies or moulds are required for volume production. Pure iron is deposited from an electroplating solution directly on the surfaces of the pattern which has been rendered conducting by means of graphite. Almost anything but aluminium or zinc can be the material of the pattern; these two metals are attacked by the plating bath. The die or mould is built up to $\frac{3}{8}$ in. thickness or whatever is desired and then backed if necessary. Force dies can be made to allow for clearances by an intermediate stage which electroforms a detachable replica of the pressed or stamped product. The electroformed iron is 99.98 per cent. pure and about 50 per cent. harder than cold rolled steel.

Articles made by the new moulding and pressing procedure include headlight lenses, bonbon dishes, artificial human hands, radio dials, plastic jewellery and leather goods. Replicas in relief are obtainable from photographs by first employing the Ford Ceramic Arts process to obtain a raised original. For work on plastics the original pattern is made conducting by depositing a film of gold in an evaporative flashing process conducted in a vacuum.

The U.S. Rubber Co. has established a division at Detroit to make moulds and dies for the trade and may later license others to engage in the process.

# VECTOR DIAGRAMS

## Sign and Other Conventions

By David Robertson, D.Sc., M.I.E.E.

CLEAR thinking in any subject is only possible when the language of the subject is itself clear and exact. As there is often a looseness in both the definitions and use of some electrical terms I will give a resumé of those we require.

Electricity is just electricity. We cannot define it, but must make its acquaintance by experience of its action in conveying energy from one place to another and in converting energy from one kind to another. Any movement of electricity is an electric current which is measured by the quantity of electricity which passes per unit time. During its flow electricity takes in energy at certain places and gives it out at others.

We say that at each of these places there exists an electromotive force (EMF) which is measured by the energy received or given out per unit of electricity; also that the EMF acts

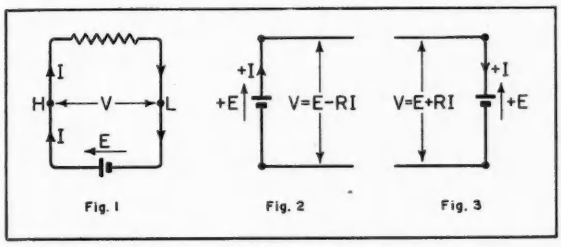



**Fig. 1.—Simple circuit. Fig. 2.—Output convention. Fig. 3.—Input convention**

with, or helps, the current at those places where the electricity receives energy, but acts against, or opposes, the current where the energy is given out by the current. These are merely our names for the conditions we find. The words, like the name electromotive force itself, were suggested by the old idea that electricity was some kind of matter.

There are various kinds of EMF, corresponding to the various kinds of energy. We have a chemical EMF in a voltaic cell; a motion EMF in a dynamo-electric machine; an inductance EMF corresponding to the giving out or taking in of the magnetic strain energy in the surrounding medium; a dielectric EMF in a condenser; a resistance EMF wherever a current flows because of the generation of heat and so on. The resistance EMF differs from the others in one important respect, for it reverses when the current reverses and consequently always takes energy from the current. The others play fair and either give or take according to the circumstances.

### PD and EMF

Consider the simple circuit of fig. 1, consisting of a battery and a wire, divided into two parts by the points H and L. The battery part of this circuit is giving out energy to the other part which converts that energy into heat. The energy transferred per unit of electricity is the difference of potential (PD) between the two points H and L; it is equal to the algebraic sum of all the EMFs in any path from one of these points to the other. This path is not restricted to the conducting circuit but of course the resistance, inductance and dielectric EMFs must be included along with the others in "all the EMFs." Note that an EMF has to do with the taking in and giving out of energy by the current, while a PD has to do with its transfer from one place to another.

With respect to one another, we say that H is at a high potential and L at a low potential. It is often stated that "the current flows from high potential to low potential," but this is exactly one half of the truth for the current equally flows from low to high potential in the other portion of the circuit. The current flows from high to low potential in that part of the circuit which receives energy from the remainder, and from low to high in the portion which gives out energy to the remainder. This is not so much a statement of fact as a definition of what we mean by the terms "high" and "low" in this connection.

If there happens to be only one EMF in the path we choose, the PD is equal to that EMF. If the net EMF be zero, the PD will also be zero no matter how much current may be flowing. You may even have a current flowing in a circuit which has all points at the same potential by thrusting a long magnet into a circular copper ring symmetrically along its axis. What happens is that the work you do against the repulsive force is distributed uniformly round the ring and that each little bit of the ring gives out as heat and magnetic energy exactly the same amount of energy as it receives from you. There is no transfer of energy round the ring and therefore no difference of potential between any two points on it.

Ohm's Law, when true, applies to the resistance EMF; it only holds for the PD in the special case where other EMFs are either absent or balance out.

### Input and Output Sign Conventions

We all "know" that a choking coil takes a lagging current and that a condenser takes a leading current, for hundreds of textbooks have unanimously told us so. They also tell us that a synchronous machine running as a generator on an infinite bus requires an increase of excitation to deal with a lagging current and that when it is running as a motor an increase of excitation causes it to take a leading current. Now, how does the machine know whether the label we have attached to it reads "generator" or "motor," especially when there is no mechanical load?

Fig. 2 shows a storage battery giving out current and fig. 3 shows it being charged. In both cases the EMF acts upwards, but the current flows upward through the battery in one case and downward in the other. If we take the current as positive when flowing with the positive EMF a positive power is an output from the battery; a charging current and the corresponding power would then be negative. This is the output convention as to sign. But if we take the positive current against the positive EMF, as in fig 3, these statements must be reversed; a positive power is now an input to the battery and a negative power an output from it. This is the input convention.

The PD between the terminals is the algebraic sum of all the EMFs in the battery, taken as positive when they help the positive current in the one case and when they oppose that current in the other. Since the resistance EMF always opposes the current, we have different equations for the two conventions, namely :—

Output convention $V=E-RI$. (1)

Input convention $V=E+RI$. (2)

The difference of sign arises from the fact that the same current which is called positive with the one convention is reckoned as negative with the other.

We may select whichever convention we prefer for each particular problem, but of course we must not swap conventions in the middle of a problem, and when inserting numerical values we must be careful to attach to each number the sign required by the particular convention used when deducing the formula.

It is usual, but not necessary, to adopt the output convention when the apparatus concerned is supposed to be giving out electrical power, and the input convention when it is supposed to be taking in power. This avoids negative numerical values for the symbols so long as the apparatus is really functioning in the way supposed; it does not really matter if that supposition is wrong provided the correct signs are given to the numerical values.

When, as with the storage battery, the flow of power is sometimes in one way and sometimes in the other, there is no reason why either convention should be preferred to the other. Similarly, with alternating currents we may take the positive current as flowing either with or against the positive EMF, but here we generally have inductance and possibly dielectric EMFs as well as resistance EMFs which must be taken into account.

### Avoiding Confusion

A change from one convention to the other will reverse the sign of the current and therefore reverse the current vector relatively to the PD vector. Thus, *a current which is in lagging quadrature under one convention becomes one in leading quadrature under the other.* If a vector diagram is to be free from ambiguity, the convention used must be specified, or a circuit diagram must be given which contains equivalent information.

The common practice is to select that convention which makes the angle between the current and voltage vectors lie within the limits ± 90 deg., but it is not sufficiently recognised that two contrary conventions are in regular use. As circuit diagrams with positive arrows clearly shown are seldom

given, the beginner may be forgiven if he sometimes gets confused.

The current in a choking coil is regarded as a lagging one and that in a condenser as a leading one merely because the input convention is universally employed for these pieces of apparatus. If we used the output convention, we should call the choking coil current a leading one and the condenser current a lagging one.

This gives the clue to the apparently inconsistent behaviour of the synchronous machine mentioned above. The fault lies not in the machine but in ourselves for we have changed our viewpoint. With the "generator label," we think in terms of the output convention from mere force of habit, but with the "motor label" we unconsciously adopt the input convention. Thus we call the same current a lagging current with the one label and a leading current with the other.

### Vector Rotation

With alternating currents, in addition to the resistance EMFs we may have inductance EMFs proportional to the rate of change of the current and dielectric EMFs proportional to its time integral. Now, the rate of change of a sine function is another sine function of the same frequency, of $\omega$ times the amplitude, and a quarter cycle ahead in phase. Conversely, the time integral has $1/\omega$ times the amplitude and is a quarter cycle behind in phase.

If the original function be represented by a rotating vector whose direction represents the phase of the function at some selected instant of time, the rate of change may be represented by another vector 90 deg. ahead, and the time integral by one 90 deg. behind. As time goes on, all three vectors rotate at the same rate and retain their relative positions. Each vector represents the amplitude to one scale and the RMS value to another scale; the instantaneous values are given by the projections on the vertical to the amplitude scale, not the RMS scale.

The total voltage across a circuit may be divided into components in phase with and in quadrature with the current. For short, these may be termed the P and Q components. Their magnitudes are RI and XI, where R is the equivalent resistance and X the reactance of the circuit. We may therefore write :—

$$V =_v RI + jXI \quad \ldots\ldots (3)$$

The little $v$ after the equality sign indicates that the addition is to be performed vectorially by the parallelogram of vectors, not algebraically, whilst the $j$ is to remind us that the XI is to be laid off along the Q axis and means "turn 90 deg. forward" about the axis round which the vectors rotate. To "divide" by $j$ means "turn back through 90 deg." The $v$ may also be inserted as a subscript after the + and − signs when it appears to be necessary, or it may be replaced by an $a$ when it is desired to emphasise that an algebraic process is intended.

A vector is reversed when it is twice turned forward, or backward, by 90 deg., that is if it is "multiplied" twice by $j$ or once by $j^2$. Thus "multiplying" by $j^2$ has the same result as multiplying by $-1$.

For this reason it is commonly stated that $j = \sqrt{-1}$, but it is quite wrong to do so. The $j$ indicates a perfectly simple process of rotation about a particular axis, whereas $\sqrt{-1}$ is a number which does not exist in reality but only in our imagination and it certainly does not involve any axis of rotation.

It is very desirable that the terms "real" and "imaginary" should be deleted from our notation for vector equations. The special meaning here given to them differs so much from their everyday meanings that they only confuse the beginner. Before he can grasp these special meanings he must forget what he has already understood them to mean. Thus, instead of speaking of the real and imaginary components, or the real and imaginary axes, it is both simpler and clearer to refer to the P and Q components or to the P and Q axes.

# High-voltage Transmission in Holland

## 150-kV Underground Cable

ALTHOUGH the Dutch are conversant with underground cable construction, they had never until recently tried anything greater than 50 kV, which is their normal transmission voltage. The nature of the ground in Holland, with water at very slight depths, renders the anchorage of transmission line towers costly (this is one of the reasons why only 3 per cent. of the present 50-kV grid is overhead), while the danger of storms blowing down the lines greatly increases maintenance costs. For these reasons the Dutch Institute for the Testing of Materials (KEMA) was asked whether the use of underground cables for high voltage would be safe, and what specifications should be required.

The first tests showed no practical difficulty in the way of a 150-kV cable for carrying 50,000 kW at a power factor of 0.95, equivalent to 200,000,000 kWh if the period of utilisation is calculated at 4,000 hours. For cost estimates, however, the period of utilisation was calculated at 2,500 hours, which gave an estimated cost of cable construction of 20 florins per kW, or 0.004 florin per kWh (florin=2s. 8d.). It was further suggested that instead of a cable of strictly sufficient capacity, one with 240 sq. mm. cross sectional area of copper should be used. This would reduce resistance at 50,000 kW, and would allow for the possibility of increasing the load carried to 100,000 kW later on. Therefore, for the construction of the tie line between Rotterdam and The Hague it was decided to use an Emmanuelli type oil-filled cable, the contract for the supply of which was placed with the A.E.G. after its representative had obtained from Berlin a film showing the whole process of manufacture and testing of such cables. Dutch engineers admit that this film made a considerable impression, enabling them to see for themselves how the cable is made.

### Over-voltage Tests

Before acceptance each length of cable was carefully tested at 220 kV, 50 cycles for 10 min. and the resistance of the conductor measured. Insulation was tested and also the capacity of the length of cable, as were the dielectric losses at various voltages from 45 to 225 kV. As an additional security, one section of cable was utilised to determine its life under severe overvoltages. At 260 kV the life of the cable was 100 hours, which dropped to 40 hours at 400 kV; at 500 kV its life was about one minute. All these tests were made at 50 cycles.

The line consists of four single-conductor cables, laid in a shallow trench. Three are intended to serve as the normal tie and are over-turned at intervals to obtain a rotation of phases. The fourth cable, of exactly similar characteristics to the others, is laid straight without twisting, and serves only as a stand-by.

To avoid difficulties which might have arisen from laying the cable by pulling from a drum in the usual fashion, a special laying vehicle was used. This consisted of a flat truck which could be drawn along the roads, alongside the trench in which the cable was to be laid, on which the drums of cables were supported on racks. At the rear of the truck a long guide was fixed by means of a swivel, the guide being built to resemble a roller transporter, and bent downwards at the end. To avoid the strain which would have been put on this by the weight of the cables, a pair of wheels surmounted by a frame formed a support about halfway along the length of the guide. The cable could thus be pulled off the drum and along the gently curving guide while drawing the truck along the trench.

### Separate Armouring

For the greater part of the route length ordinary unarmoured lead sheathing was used, but for crossing over bridges and wherever there was a danger of mechanical strain on the cable armour was carefully added to the outside in such a way as to form a protection without being in any way fastened to it, so that strains on the armour would not be transmitted to the cable itself. A telephone cable has also been laid in the same trench, and to minimise the effect of its proximity to the high-voltage cables, it is zig-zagged from side to side of the trench.

There are two compensation coils at either end of the tie, one of the four acting as a stand-by. They are of 25 kV, three-phase at 11 MVA each, connected to the low-voltage side of the transformers at each end of the tie. For the fourth cable, which acts as a reserve, one compensation coil of 16.5 MVA is provided at each end.

Protection against electrolysis of the cable sheath is given by a layer of bitumen, two layers of paper, and a cover of asphalt and jute. At points where electrolysis was particularly to be feared, as in crossing under tram tracks or other cables, a special additional insulation of rubber tape was applied over the jute. At all joints between sections of cable this insulation was very carefully restored, over the joint, and care was taken to see that a good electrical connection was provided between the sheaths of the two adjacent sections. In the sub-station at each end of the tie the sheath has been electrically tied in with the sheaths of all the other cables in the station.

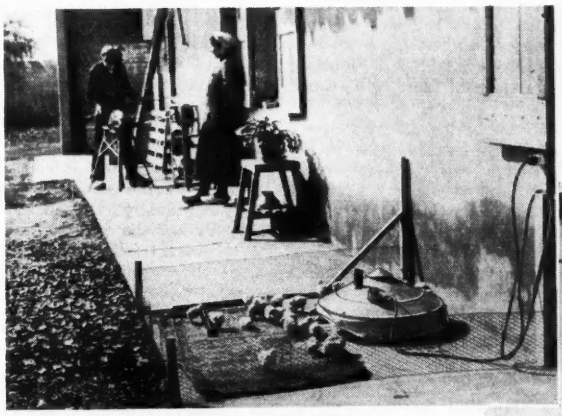
# AN ELECTRIFIED VILLAGE

## Interesting French Experiment

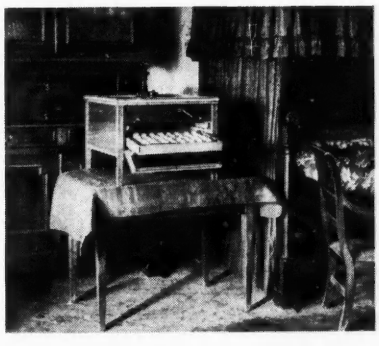
LAST June an interesting experiment in rural electrification was inaugurated at Vaudrenand, a village situated about ten miles east of Macon. The village has had a limited supply of electricity for some years, a local miller who was granted a concession in 1897 having installed plant at his mill which generated between 10 and 25 HP according to the flow of water in the stream. The present scheme has been undertaken by the Union Electrique, which has now taken over the old concession.

The population of the village is 108 persons, living on 30 farms with an average area of about 15 acres. Only two farms—of 185 acres and 75 acres—may be described as moderately large. It was possible to include 28 of the 30 farms in the experiment.

On some of the farms additional lighting was installed, but the real aim of the Union Electrique was to develop the use of electrical apparatus. With the help of the local authorities it was possible to install twenty incubators (seven of 110-egg and thirteen of 80-egg capacity), ten hovers, twelve multiple-use ½-HP motors, five electric kitchen ranges, two electric cookers for animal fodder, two saws, and two radio sets, representing a total connected load of 33.2 kW and providing an estimated annual consumption of about 14,000 kWh. Apart from this apparatus there were already twenty-three electric irons and fifteen radio sets.



**One of the electric cookers for animal food**



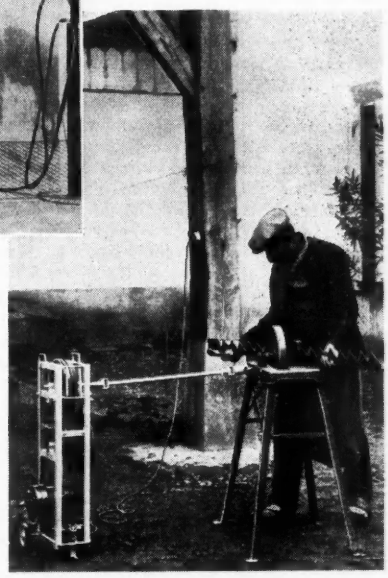
The village is almost entirely composed of small farms; it is, therefore, not an "average" locality, such as has been chosen for previous experiments, but a distinctly rural locality. Secondly, the farms of the district are noted for their thriftiness, so that any electrical apparatus used may be considered as being a paying proposition and not merely labour-saving.

The method used at Vaudrenand, as in previous localities, was to supply the apparatus free of charge for one year, the farmer paying only for the electricity used, and either buying or returning the apparatus at the end of the year. Since the inauguration of the experiment one farmer has already purchased a motor and another a cooker for animal food. It is expected that the greater part of the incubators will be sold by the end of the year.

Poultry raising is an important industry in the district, and the villagers have increased their production seven times by the use of incubators. Hovers are not so popular, the farmers preferring to let the chicks come into the house to keep warm rather than spend money on a hover and the electricity for its operation. This gives some idea of the difficulty met with in electrical propaganda.

Motors, on the other hand, are proving quite successful, being particularly appreciated by the women. In order to render the motors as versatile as possible they are built into a light frame carrying a series of pulley wheels geared together to provide a wide range of speeds.

The cost of the experiment is quite low, due in part to the existence of nearby high-voltage lines and a low-voltage system of sorts. Construction of a transformer station cost 20,000 fr., while reinforcement of the low-voltage system necessitated by the increased load raised the total figure for line work to 25,000 fr. New meters and leads cost an additional 4,000 fr., while internal wiring installations cost 6,000 fr., making a total of 45,000 fr. To this it is necessary to add about 60,000 fr. for the value of the apparatus installed, most of which will probably be recovered at the end of the first year of operation.



**(Above) a hover installed on a farm at Vaudrenand**

**(Below) an incubator in a farmhouse and (above) a motor driving a grindstone**

Another important point about the experiment is that each piece of apparatus was installed by a qualified electrician who also demonstrated its use. This was considered important as the farmers might refrain from using the apparatus merely because they did not quite understand how to operate it. The farms are also regularly visited by representatives of the company who give advice on how to overcome any problems which may be encountered, a service which is greatly appreciated by the community.

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## Heat-insulated Houses

TESTS carried out in the United States by the Tennessee Valley Authority are claimed to show that adequate insulation of a house against heat loss can cut the fuel bill nearly in half. Two identical four-roomed houses were chosen for the experiment, each equipped with an electric heater in a small special chamber centrally located on the first floor.

One house was insulated throughout, *Science* states, at a total cost (labour and materials) of $200, by special wool bats in the walls and over the ceilings and an insulation board under the floor joists. Both houses had both doors weather-stripped. The residents in each case kept to the same schedule of window opening and operation of the heaters. A reduction of 44.75 per cent. in total heat loss was obtained in the insulated house.

# WHOLESALE DISTRIBUTION

## The Choice Before Manufacturers

## By J. Whitehead

HOW best can the manufacturer distribute his products in the most efficient and economical manner to best serve the needs of the electrical industry? Much depends on the nature of the product, but in considering the comparatively small electrical accessories and fittings of which large numbers are regularly purchased he can either distribute directly to retailers, contractors and industrial users or he can distribute through wholesalers.

He realises that direct selling means that his selling prices will have to include the selling costs to all users and prospective users of his materials, that a sufficiently large selling force to cover the country will be essential, and in addition a large and efficient packing and despatch department will be necessary. With certain highly technical accessories the direct method of distribution is essential. The selling staff are experts and in a position to answer every kind of problem in connection with the product. The selling price is high of necessity but more often than not includes legitimate payment for the value of technical information and advice given on the uses and installation.

New products to which the ultimate user has to be educated are often distributed direct at the outset and when they are sufficiently well known and established in the market the distribution is transferred to the wholesaler. The distribution of electrical accessories and fittings through wholesalers assists the manufacturer to reduce his general costs of distribution so that the ultimate user enjoys the benefit in a reduced price. The wholesaler's costs of distribution are spread over many lines and in consequence his operating, warehousing and selling expenses per article are only a fraction of those of direct selling.

There are some manufacturers who have had sad experiences of distributing through wholesalers, but the failure has been due to the manufacturers expecting too much. It is the manufacturers' responsibility to see that their products are distributed. The same functions must be performed in this distribution whether they distribute direct or through wholesaler outlets.

### Advice and Service

A wholesaler can handle as many lines as his financial, warehousing and distributing facilities allow. According to the demands of his customers he may be handling the products of competitive manufacturers with the result that his sales do not come up to the expectations of any of them. The manufacturer obviously must create major consumer acceptance for his product if he is to achieve preference over the other lines handled by the wholesaler and a reasonable amount of "field work" on the part of the manufacturer is therefore most essential.

Of course, a wholesaler can handle too many products with the result that selling effort is so scattered that he does not do an efficient selling job for any one manufacturer, but such cases are few and far between. In functioning as the purchasing agent and storekeeper for his many customers he could not afford to be careless in his buying, nor could he fail to keep abreast of development in the products he is handling. To be able to advise the prospective buyer on the choice of materials and immediately provide him with authentic data concerning these materials means the closest co-operation with the manufacturer. It means that the wholesaler must organise his sales force on a speciality selling basis if he is to achieve the best results.

No wholesaler can be impartial between two manufacturers of the same products and if the manufacturer has to make all the direct consumer contacts and is called upon to do so much of the selling work then wholesaler distribution is unnecessary. The manufacturer selects his wholesale distributors with the object of reducing his distribution costs by limiting the number of outlets for his products and limiting also the value of each order through those outlets. The wholesaler, therefore, is called upon to decide which particular line of each type of product will best serve his customers and concentrate his selling efforts on these lines.

It has been suggested that a wholesaler buys discounts rather than products and thus changes his sources of supply for a price advantage. Nothing could be further from the truth. Many accessories and fixtures for which there is a regular sale provide the wholesaler with a very meagre return for his efforts and even though there may be inferior products on the market with attractive discounts for the wholesaler he must consider always the interests of his customer. The wholesaler is vigorously existing to-day and this is a tribute to the indispensable service which he undoubtedly renders to both manufacturer and consumer.

He plays such a valuable part in the distribution of electrical merchandise that every large manufacturer must consider his assistance vital to permanently profitable business. His representatives have a responsibility far beyond just making calls. Their effectiveness is measured by their ability to serve their customers and there is no surer way of doing this than selling their customers products which already have ready acceptance in the industry. The manufacturer's territory is the entire country but the wholesaler confines his efforts to a comparatively small territory with the result that he is fully conversant with all possible outlets in that territory for the manufacturer's goods and directly promotes each one. The policy of wholesaler distribution has been proved sound because it enables the manufacturer to place stocks at vital distribution centres all over the country and have men readily available to explain the various items of his range.

### Personal Contact

These men, the wholesalers' salesmen, are trained to render a personal sales service. They make quickly available, upon occasions, the services of the manufacturer's sales representative, a specialist in his own field capable of solving highly technical problems. Furthermore, they are friends and neighbours of their customers for they live in the territory and have the same community interests. They act as buffers between the manufacturer and the user and are generally in a position to go further to keep a customer satisfied than will the manufacturer.

Their intimate knowledge of the customer enables them better to judge the fairness of the complaint than can the manufacturer's salesman, who can afford to call frequently on only the largest buyers. The medium-sized customer he visits at infrequent and often irregular intervals, whilst the smaller users, whose combined purchases may possibly be equivalent to the other two categories he is not able to visit at all. The wholesaler's salesman, however, makes contact every worthwhile buyer both regularly and frequently. He comes to know his customers intimately and to understand their problems and their requirements—a valuable asset to efficient distribution.

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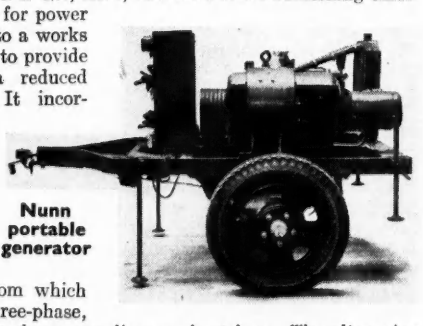
## Portable Generating Plant

A NEW self-contained generating unit has been designed by H. E. NUNN & CO., LTD., Manchester for furnishing emergency supplies for power as an adjunct to a works fire service, or to provide lighting for a reduced night shift. It incorporates a 22.5 - k V A (0.8 p.f.) 50-cycle Crompton - Parkinson alternator controlled by a switchboard from which either 400-V, three-phase, or 230-V, single-phase, supplies can be taken. The alternator is driven through a sextuple belt by a V-8 type engine designed to run on either petrol or gas and having two blocks of four cylinders cast integrally with the upper half of the crank-case. The radiator is thermostatically controlled.



**Nunn portable generator**

The whole equipment is mounted on a two-wheeled truck with oversize brake drums, Girling over-run gear and a tubular axle of 40-ton high-tensile steel. It is entirely shielded to render it stormproof, having doors and louvres to give access and ventilation to the electrical equipment. The overall length is just under 8 ft. and the width 5 ft. 6 in. Clamp jacks at each corner of the frame support the unit rigidly under operating conditions.

# POINTERS TO PROGRESS

## Recent Technical Developments

DESPITE the unsettled international situation, last year was one of expansion and development in the manufacture of electrical plant and apparatus for both home and overseas service. From the contracts in hand or recently completed, an idea may be obtained of the trends of technical development and of their effect on future practice.

In judging the merits of engineering products, assuming equal reliability and safety, first considerations are the attainment of the greatest power for a given weight and space, the placing of the greatest amount of easily controlled power at the disposal of each operative and the provision of facilities for the precise control and measurement of power. The most obvious examples of the importance of the power-weight ratio are given by turbo-alternators. A high ratio minimises capital charges, increases thermal efficiency and reduces the cost of power station sites. Moreover, generation bears a simple statistical relationship to other electrical activities. Thus for every kilowatt installed in generating stations more than 3¼ kW of apparatus (requiring some 6,500 kWh) is installed on consumers' premises. Further, the intervening transmission and distribution systems involve a capital expenditure of at least twice as much as that needed per kW at the power stations.

Two-pole alternators meet the requirement of providing large output from the least dimensions. For that reason one of the most interesting of the turbo-generators put into commission in 1939 is the 50,000-kW set at Bunnerong (Sydney), which was the first three-cylinder 3,000-RPM turbine of that size constructed in Britain. This record has been passed, however, by another three-cylinder single-axis, 3,000-RPM set, one of 60,000-kW built for an English power company, which has the additional feature (originated in this country) of employing the reheat cycle. Other notable sets running at the same speed are two of 45,000 kW and four of 40,000 kW.

**From the annual reviews of the principal electrical manufacturers a good idea of the trend in technique can be gained. The accompanying notes indicate the more important advances made in many directions.**

In the cases cited, stop-valve steam conditions have not been above the now usual 600 lb. per sq. in. and 825 deg. F., but compactness can also be attained by adopting higher steam pressures and temperatures. Instances of this are a 60,000-kW, 3,000-RPM two-axis set for operating at 1,900 lb. and 930 deg. F. and two 32,000-kW 3,000-RPM turbo-alternators for 1,300 lb. and 950 deg. F. The latter pressure was, we believe, chosen in one case on the ground that round about 50,000 kW was the minimum size of set to justify the use of 1,900 lb. or so. Nearing completion is a 100,000-kW set, one component of which is a 16,000-kW turbine for 1,300 lb. and 950 deg. Steam conditions are at the turbine stop valve, implying an even more difficult problem for the boiler and superheater manufacturers. This achievement and others of a like nature have fully justified the attention paid to research into the behaviour of steel alloys at high temperatures by concerns mainly associated with electrical work.

In another design of turbine the use of a double-rotation principle has enabled a high effective speed and rapid starting from cold to be obtained in sizes upwards of 37,500 kW in a single casing. At the other end of the scale comes a small portable turbine unit developed for emergency duties. With a view to facilitating the operation of interconnected stations, a scheme is in hand for controlling the load on one large power station in accordance with the system frequency and the operation programme.

Heavy oil engines up to 3,500 HP are finding further scope in overseas applications, particularly at high altitudes, and also for Diesel-electric shunting locomotives everywhere. Weight reduction has been considerably aided by the fabrication of structures. The development of electric welding for outside industries owes much to the experience gained by electrical manufacturers in applying it in the first place to their own products.

### Water-Power Plant

Although this is not usually regarded as a water-power country, we yet have hydro-electric schemes of some magnitude, including one station where 100,000 HP of British turbo-alternators are installed. The experience of manufacturers in this field has been amplified by the building of turbines and/or generators of as much as 30,000 kVA for important projects abroad. Many of the water-power stations are controlled automatically or from a remote point and reliable relay systems have been devised to suit practically any local circumstances.

Generation direct at transmission voltage has proved entirely satisfactory, as is evident from the increasing number of orders received from municipal as well as power companies for 33-kV alternators. In this way sub-station space has been economised by the elimination of the step-up transformer which, where switching is at transmission voltages, actually forms part of the generating unit. High-voltage generation has not, however, appreciably influenced the demand for large transformers, which were built for capacities of as much as 45,000 kVA at primary voltages up to 132 kV, usually with natural oil cooling for half load or rather more when an air-blast comes into play. There is a tendency to make these transformers as self-contained as possible in order to minimise work on site. This is true especially of the transportable type for emergency use, several of which have been made in capacities up to 30,000 kVA.

There is also a trend towards increasing the number of tapping steps in the on-load tap-changing equipment incorporated with larger transformers, we are informed by one manufacturer, who states that the use of protective resistors instead of reactors in tap transition saves space, weight and cost. Electrical stresses are reported to have been considerably reduced by shielding the windings for 66 kV and above.

The reliability of modern transformers is illustrated by particulars sent us of a test carried out on a 2,000-kVA, 6.6/33-kV three-phase unit having an impedance of 5.7 per cent. No signs of stress were observed when the secondary current reached an asymmetric peak value of fifty-six times the normal RMS current, *i.e.*, 27 per cent. more than the maximum possible short-circuit current in service.

With regard to smaller transformers on distribution networks it would appear that the price of these could be considerably reduced if they were ordered in larger numbers at a time and if minor departures from standard were not called for by supply undertakings. A non-inflammable substitute for oil is being used in power transformers where unusual fire hazard justifies its extra cost.

The savings in weight and space and the simplification of connections that have caused single-phase banks of transformers to be superseded by three-phase units on power systems have been extended to electric furnaces. The latter can also be fitted with motor-driven off-circuit tap-changing equipment on the high-voltage side and the voltage adjustment range increased by star-delta switching. A tapped reactor in addition should enable a desirable constancy in reactance at all voltage ratios to be obtained. Three-phase unit construction is similarly being applied to oil-immersed current-limiting reactors, which in conjunction with the demand for independent voltage regulators (as distinct from tap-changing) illustrate two not always easily reconciled requirements of modern transmission.

It is encouraging to deduce from the orders received for arc-suppression coils that these are fulfilling expectations in materially lessening the number of line-to-earth faults (much the most common) on overhead systems and that the technique of their application is being grasped as a result of experience.

### Switchgear

Developments in high-voltage switchgear reflect the tendency for 33-kV to be adopted instead of 6.6 and 11 kV for power distribution. Lightness in moving parts to secure rapid interruption has been obtained, largely with the aid of high-tensile steels and magnesium-aluminium alloys, and total break times of three cycles have been achieved. Low oil-content circuit h.r.c. breakers for high-voltages have come to stay, one new power station having recently increased the number installed to twelve at 132-kV. Low-oil content is also a feature of the space-saving 33- and 66-kV single-break metal-clad switchgear, while a new 33-kV outdoor model with three phases in one tank and unusually small arc-control pots also provides an example of compactness. High-voltage air-break h.r.c. switchgear has been adopted for controlling auxiliary circuits in several power stations, for which purpose 400-V air-break gear up to 3,000 A has also been developed

Remote-closure methods should be used at all voltages where the breaking duty exceeds 10,000 A, or 150 MVA. Spring

reclosing mechanism is now available with metal-clad circuit-breakers up to 33 kV and 500 MVA. The demand for oil-immersed 400-V switchgear (often for relatively high rupturing capacities) has been even greater than for higher-voltage breakers, but there would seem to have been no striking departures from established principles either in these or in motor control. As a result of the introduction of the N.P.L. and A.S.T.A. certificates for the type-testing of circuit-breakers, the four short-circuit testing stations (including one recently put into service) have been well occupied during the year.

### Direct-current Plant

Direct current shows few signs of being entirely superseded in its applications by AC. In spite of the large number of rectifiers being built the demand for rotating conversion plant is reported to be well maintained. Apart from transport requirements, the strong DC position is in large part due to the good results obtained with the Ward-Leonard system, whether for rolling-mills and winders or for ½-HP machine tools. Advances in heavy-current DC generators at from 4 to 50 V for electrolytic work have been noteworthy, as much as 16,000 A being taken from a single commutator.

Pumpless air-cooled steel bulb rectifiers are strong competitors of the water-cooled steel-tank and the glass-bulb types, chiefly at voltages below 3,000 DC. There is evidence that grid control (in which still further improvements are promised) has proved quite effective in suppressing arcs due to back-fire or short-circuit at high anode ratings, in addition to providing valuable over-compounding characteristics.

Insulation occupies a leading place in research. The development of suitable varnishes for use with glass fibre (which formed the subject of a special article in our last issue) has enabled the advantages of the latter to be realised for heavy duties. Another promising line is the use of plastics as cable dielectric, while the potentialities of fluorescent powders in lighting are by no means exhausted.

For outstanding examples of engineering in its utilisation aspects during 1939, e.g., in the electrification of transport, factories, mines and ships, we must refer our readers to accounts published in this and other recent issues of the activities of electrical manufacturers, from whom much of the information given in this article has been obtained. The rate of progress exemplified may, unfortunately, be checked for a while in certain directions, but it is gratifying to find that the claims of the future are not being overlooked in the extreme urgency of the moment. Reference should be made to the large scope of some of the contracts, which has appreciably exceeded the purely electrical aspects. A pleasing feature, generally, is the large proportion of repeat orders that have been received from all parts of the world.

# Manufacturers' Activities—II

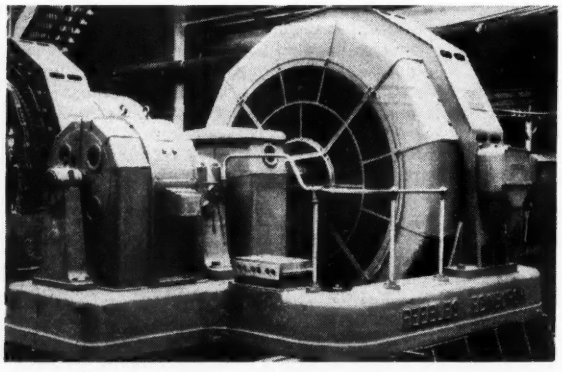
## Some Outstanding Orders During 1939

## Bruce Peebles & Co., Ltd.

THAT there has been no falling off in the demand for converting plant during the past year is the experience of Bruce Peebles and Co., Ltd., who received orders for or had in hand the construction for home and abroad of motor convertors rated at up to 1,500 kW each, the nine largest machines having an aggregate capacity of close on 7,000 kW, in addition to two 1,000-kW synchronous-induction motor-generators and one 1,500-kW and three 250-kW mercury-arc rectifiers.

Most of the alternators under construction have been designed for coupling through gearing to steam turbines and a large proportion is for the Dominions. The total output of those of the principal range of from 1,000 to 2,000 kW is over 18,000 kW, including a 1,000-kW synchronous condenser.

Outstanding contracts for industrial electrification cover thirteen 1,900-HP, two 575-HP and six 550-HP synchronous-induction motors and nine 300-HP induction motors. A winder for a Canadian coal mine comprises a 715-kW Ward Leonard set and a 900-HP DC motor. Representative of orders



**A 1,900-BHP, three-phase, 50-cycle 11-kV, 250-RPM unity power factor synchronous induction motor erected for test at the works of Bruce Peebles & Co., Ltd.**

for Scottish coal mines is one covering the provision of three 75- and three 50-HP, 3,000-V flameproof AC motors and several smaller motors.

The largest transformers in course of manufacture are two of 30,000 kVA (ON up to 19,000 kVA) with remote electrically operated tap-changing gear on the higher-voltage side, and five of 20,000 kVA. Other orders by British supply undertakings are eighty units with an aggregate output of 31,000 kVA, thirty-eight totalling 33,500 kVA, and 140 running out to more than 27,000 kVA. For Canada there is a 3,000-kW, 121/46-kV single-phase transformer and six 1,500-kVA, 21/66-kV three-phase units as well as a 1,000-kVA "through-put" automatic voltage regulating transformer for 4,000 V, and for New Zealand three transformers of 6,000 kVA at 21/66 kV.

## General Electric Co., Ltd.

EXPORT is, despite hostilities, still a major activity of the General Electric Co., Ltd., whether at Witton or at its Fraser & Chalmers Works at Erith. Many of such contracts are repeat orders; for example, a 40,000-kVA, 3,000-RPM turbo-alternator under construction is the tenth of the same make supplied to Johannesburg and a 17,000-kW set is the fifth for Adelaide. A further repeat order is a 37,500-kVA unit for an English borough. Generators with outputs up to 7,000 A at between 5 and 50 V for electrolytic work are other outstanding features.

A large proportion of the generators built for oil-engine drive will also operate overseas. The same consideration applies to 110- and 66-kV transformers and also to the numerous pumpless air-cooled rectifiers on order; for the latter, cylinders capable of giving 1,000 A with overload ratings are now available with or without grid control. The largest transformers in hand are two of 45,000-kVA capacity.

Circuit-breakers (500 MVA at 22 kV) for protecting the transformers of rectifiers have been made with light moving parts to give the equivalent of "high-speed" operation. A new type of compact 33-kV outdoor breaker for 750 MVA has been devised with the three phases in one tank and small arc-control pots.

Industrial electrification is exemplified by a contract for a large steelworks, the slabbing mill auxiliaries for which are driven by 250-V three-phase 11-cycle motors, while the 121 rollers of the mill run-out table are each driven by variable speed three-phase motors at 16.7 to 50 cycles and 134 to 440 V; the shear drive has a duty cycle of only 10 sec.

For a West African gold mine, conveyor, crushing and treatment plant and aerial ropeways for dealing with 500 tons a day, together with three 725-kW oil-engine alternators, switchgear, transmission lines, outdoor sub-stations and 1,600 HP of motors are being supplied.

Complete electrical equipment for eight three-car trains to work at 1,500 V in conjunction with regenerative locomotives and 1,400 traction motors represent important railway contracts for England. An order from Belfast Corporation for 114 trolley-buses is said to be the largest ever placed outside London. Among a number of other similar contracts that for Edmonton (Canada) is especially notable in that the 135-HP motors have the largest capacity ever used with single-deck vehicles.

Contracts for 132-kV and 66-kV oil-filled cable are in hand. Cables with welded stainless steel sheaths are also being produced. One of the three sizes of the Pirelli-General lead-extrusion machine has been exported to Canada. Considerable progress is reported in the application of plastics to cables—in some instances in conjunction with rubber.

Several complete installations for the heat-treatment of steel parts are nearing completion; these include vertical cylindrical hardening, tempering and nitriding furnaces, automatic pusher furnaces, rotary-hearth furnaces with artificial gas atmosphere and horizontal nitriding furnaces. Two 140-kW furnaces internally 5 ft. 6 in. wide by 12 ft. 6 in. long and 3 ft. high

have recently been started up for annealing large aluminium sheets.

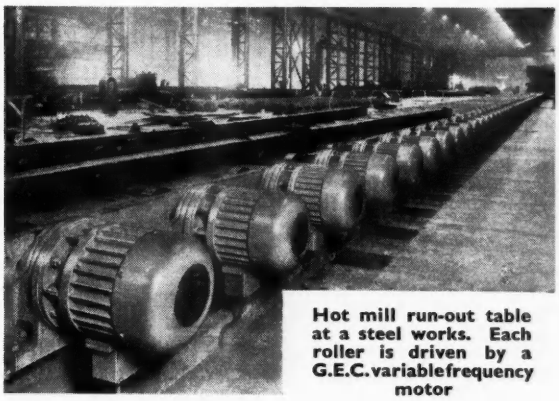
A new design of unit air heater with adjustable louvres on the air outlet is being manufactured for use in factories, warehouses and garages. Water-heaters in production for working-class flats employ a 15-gal. welded copper cylindrical tank, loaded up to 3 kW with thermostatic control. A newcomer to the range of sterilising chests is one of 16 cu. ft. intended primarily for smallholders; the steam, which is supplied from a 3-kW rectangular boiler below it, can be diverted from the cabinet for other purposes, as in the case with the larger models.

Some of the most striking of the large cooking equipments are for ships. These often incorporate a tilting boiler with stainless-steel interior for vegetables or milk foods. There is also the new DC 105 domestic cooker for seven to eight persons with two boiling plates and grill-boiler, measuring 12 by 10 in., and side and bottom heating. The "Ovenmaster" thermostatic control unit has been recalibrated to conform with the new E.D.A. dial markings. Other new household appliances are a 1,500-W kettle of heavy-gauge copper with chromium-plated exterior designed to boil three pints of water in 7½ min., a new immersion heater (1, 2 and 3 kW) incorporating a safety device, and a compactly designed 3¼ cu. ft. refrigerator.

New instruments include a heterodyne reactance comparator, a thermionic test set giving a wide range of AC and DC voltages and currents, and a miniature illumination meter with a range of from 0 to 250 candles.

Notable in the range of fractional-horse-power motors is a geared 1/40-HP single-phase s.c. design (capacitor start and run) with an external condenser permanently in circuit, a 1/60-HP 2,500-RPM model for medical service and a compact split-phase ¼-HP 1,440-RPM machine with resilient base for mounting underneath a washer.

Much of the work carried out on illumination has been influenced by A.R.P. requirements. Black-sprayed lamps have been produced for reducing the total light to 1 per cent. of the normal and internally blue-sprayed lamps to give from 5 to 30 per cent. of normal. Fluorescent lamps have found an extended field due to the obscuring of windows, where precision work has to proceed by artificial light for twenty-four hours a day. An alternative is the combination of mercury-vapour and tungsten-filament lamps in indirect fittings. Fittings for illuminated signs and for bus lighting under present restrictions also fall into the A.R.P. category.



**Hot mill run-out table at a steel works. Each roller is driven by a G.E.C. variable-frequency motor**

The fixing of nickel grids above the filaments of 2- to 10-kW tungsten lamps has minimised volatilisation. A protected type of choke for "Osira" lamps with 5-V taps (instead of the 10-V taps available with the wax-filled type) is another recent development.

# New Sheet Insulating Material

## By Dr. H. Ainsworth Harrison

THE development of a new sheet material having clay as its basis has recently been reported in the United States. A group of American physical chemists have made use of recent developments in colloid chemistry to prepare from certain types of centrifuged "Bentonite" clay dispersions having a particle size below 25 millimicrons, a non-metallic inorganic film or sheet, by concentration, desiccation, and subsequent heat, pressure and chemical treatment. To this material the name "Alsifilm" has been given, the word being derived from aluminium silicate which is the basic constituent of all clays.

Only clay particles of the very smallest size (25 millimicrons is only 25 millionths of a millimetre) can be used for this purpose, since the special characteristics of the resulting film depend primarily on the closeness of packing and the peculiar structure which only such fine particles can form themselves into.

### Process of Desiccation

When a colloidal suspension of such a clay is observed under an ultra-microscope the individual particles can be seen in rapid Brownian motion, and each particle scintillates because of the facets which make up its characteristic surface structure. If, however, the colloidal suspension is concentrated the Brownian motion will decrease until it stops completely, the particles assuming certain positions relative to one another in accordance with the well-known laws governing colloid chemistry.

At this point the suspension has been visibly transformed into a solid structure, or gel. The particles of clay in this gel structure are separated from one another by repelling forces, mostly of an electrical nature, due to the hydration of the particles. If the gel is submitted to further desiccation the particles will be drawn still nearer to one another. When a certain minimum distance separates them they aggregate together in a definite configuration, in accordance with the fields of force surrounding them. Further desiccation of these "Bentonite" clay gels then results in the development of these crystalline aggregates into long threads which form a closely woven network in appearance very much like fibres in a sheet of paper. Desiccation may be continued until only water of crystallisation is left.

In the process of making "Alsifilm" advantage is taken of the above-described well-known colloidal change from the sol to the gel condition by concentration, and of the peculiar development of a fibre-like structure during the carefully controlled desiccation of this particular type of clay gel, the product being obtained in sheet or film form by carrying out the dessiccation while the gel is spread evenly upon a flat surface.

This crude material still exhibits all the properties of the clay from which it was formed and in this condition it has no great value. For instance, if placed in water it will swell, finally disintegrating and going back into suspension. By desiccation, then, only an intermediate impermanent stage can be attained.

When, however, the crude material is subjected to high temperature and pressure, increased resistance to water and improved electrical properties are obtained, and these may be still further enhanced by subsequent chemical treatment involving the principles of base-exchange chemistry, about which, however, no further details are yet available.

The resulting "Alsifilm" is very tough, and absolutely impervious to water. It resists acids, electrolytes, oils and greases, is absolutely unaffected by organic solvents, and withstands very high temperatures. It is very similar in composition to mica and is claimed to exhibit equal dielectric properties. Its chief advantage over mica in the electrical industry lies in the almost unlimited size and thickness in which uniform sheets can be made. Thick sheets of "Alsifilm," like mica, are brittle and rigid, but the new material can also, by the addition of suitable ingredients, be formed into tubes.

### Special Compounds

A wide variety of such substances as dyes, pigments, resins, waxes, plasticisers, as well as fibrous materials like asbestos, glass wool, and cellulose, can be added to "Alsifilm" during the manufacturing process in order to produce special effects. The presence of plasticisers, for example, considerably increases flexibility, and the addition of white pigments produces very glossy films possessing good printing qualities.

A disadvantage of "Alsifilm" is its low tearing strength, but this can be somewhat remedied either by the addition of a finely comminuted material like carbon black or by the introduction of fibrous substances.

The chief field of application of "Alsifilm" is in the electrical industry, but other possibilities are suggested. It should be possible, for instance, to apply a coating of "Alsifilm" to paper cartons to render them suitable for holding such penetrating substances as oils, greases and corrosive chemicals, while owing to its indestructible nature it might also find application in the production of permanent records.

# INSTITUTION PAPERS

## Radio Wave Behaviour. Employment of Statistics.

## Radio Reflection and Propagation

TWO short papers issued by the Wireless Section of the Institution of Electrical Engineers are official communications from the National Physical Laboratory, representing work done on behalf of the Radio Research Board.

Curves from which the reflection coefficients at the earth's surface for radio waves of any state of polarization can be determined for angles of incidence greater than 80 degrees are presented by Dr. J. S. McPetrie and Miss A. C. Strickland. It is pointed out that the simple ray theory on which the reflection from a surface is assumed to be equivalent to the radiation from an image of the transmitting aerial in the reflecting surface is not valid for heights of transmitter or receiver which are very small in comparison with the wave-length.

From an analysis given by Mr. K. A. Norton it is deduced that even in cases for which the image theory cannot be applied the field at the receiver is the vector addition of two fields, one equal to that given by the ray theory and the other a field independent of the height of transmitter or receiver, but inversely proportional to the square of the distance between transmitter and receiver. This latter field corresponds to the surface wave which was first determined by Mr. A. Sommerfeld for vertically polarized waves. It is shown by the present authors that the surface wave is of much greater importance in the case of vertically polarized waves. As the surface-wave field is independent of height, this results in the well-known experimental fact that the vertical field from a low transmitting aerial increases in magnitude with height at a much smaller rate than the horizontal field.

In another paper Dr. J. S. McPetrie and Mr. J. A. Saxton describe an experimental investigation of the characteristics within optical range of the propagation over land of radiation having wave-lengths of two and three metres.

When using these ultra-short waves with elevated transmitting and receiving aerials it is concluded that for distances within optical range of the transmitter the electric field strength is determinable with sufficient accuracy in practice on the assumption of a plane earth (rather than curved) and optical reflection at the earth's surface.

For distances up to the optical range of the transmitter and over a reasonably smooth earth's surface the propagation characteristics of vertically and horizontally polarized waves are identical. For grazing incidence the field strength for either polarization is inversely proportional to the square of the distance between transmitter and receiver and directly proportional to the product of transmitter and receiver heights.

In towns the ratio of the measured to the theoretical field strength, assuming a flat earth, appears to be less on a wave-length of 2 m. than on 3 m. No fading in excess of ± 3 db has been observed for distances up to the optical range of the transmitter, which was lent and operated by the G.P.O. and installed at the B.B.C. station at Brookmans Park.

## Engineers and Statistics

SOME of the ways in which statistics can be of assistance to engineers are indicated in two I.E.E. papers.

Dr. B. P. Dudding and Mr. W. J. Jennett (G.E.C. Research Laboratories, Wembley) regard their paper as a somewhat elementary introduction to statistical methods of appraisement of the quality of industrial products. They emphasise the essentially statistical nature of many technical problems and the part that chance plays in many decisions, demonstrating how the theory of probability can be of assistance in industry in making deductions from test data, or in forming conclusions from the examination of samples drawn at random from a bulk.

An indication of the fundamental conception of variability is followed by a survey of the basic effect of change on the magnitudes of test values, having in mind particularly the scrutiny of data obtained in the development of new manufacturing procedures and in the control of established ones. At the end of the paper there is a suggestion that extensions to the "analysis of variance" involving correlation and regression are useful aids in testing and research directed towards the improvement of quality.

The authors emphasise that the efficient use of the statistical tool can come only by practice, and that in no sense can it be substituted for sound technical knowledge, with which in all circumstances it must be combined.

Knowledge of the manufacturing procedure helps in the choice of test samples which are all likely to have been equally subject to the system of chance causes introducing variability. Lack of statistical consistency is an indication that variability, external to the system of chance causes, exists. Technical knowledge of the manufacturing process has then to be used to suggest the origin of this variability and recourse subsequently had to statistical technique to confirm or refute the suggestion. This is the fundamental pattern on which the technique is built.

The maintenance of standards of quality invariably depends on engineers-in-charge taking action to diagnose and eliminate causes of changes in quality, the existence of which is suggested by the scrutiny of data derived from inspection and testing. On the one hand failure to recognise early any signs of a change in quality may have serious consequences and, on the other hand, much effort may be wasted if the suspicion that a change in quality has occurred is unfounded. Apart from wasted effort, the staff of a factory will tend to develop a very undesirable mental outlook if repeated efforts are made to trace causes of trouble which do not exist.

### Safety Factor Revision

In a second paper Mr. W. T. O'Dea (Science Museum, South Kensington) argues that it is impossible to discriminate even between widely disparate batches by the application of a constant numerical value in the form of a "factor of safety" employed in conjunction with a "guaranteed minimum" testing technique.

The introduction of a new set of empirical standards is recommended to replace existing "factors of safety." They should be "guaranteed minima," upon which, by statistical methods of appraisement, great reliance might be placed. The statistical methods should be so devised that they substantially eliminate the necessity of empirical allowances to cover unknown degrees of variations in batch characteristics, which cannot be reliably forecast at present from results obtained from a small sample out of the batch.

Thus we should eliminate the rough-and-ready technique of asking a "guaranteed minimum" strength of 10,000 lb. for line insulators while that for conductors carrying exactly the same load is only 8,000 lb. The reason for the difference is that the minimum cannot actually be guaranteed, but a greater range of variation is probable in insulators than in conductors. By statistical methods the minimum can be very substantially guaranteed.

The limits of error in statistical technique are examined in some detail and the results are compared with those for present methods of appraisement, to the disadvantage of the latter. The advantages of statistical control over the processes of production and the setting of acceptance levels which may be expected with a reasonable degree of confidence to be related to the actual batch characteristics are summarised at the end of the paper.

It is also shown that present ideas of an adequate size of test sample are parsimonious to the extent of ineffectuality, and it is recommended that test samples of at least 50 units should become commonly accepted as reasonable.

## Conductor Discharge Experiments

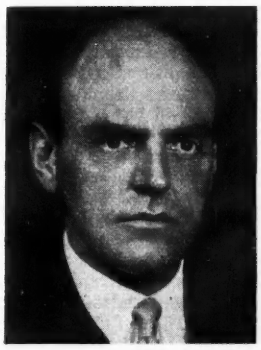
EXPERIMENTS to determine the exact conditions under which a fast-moving current of air will discharge an electrical conductor have been reported to the French Academy of Sciences by Oleg Yadoff. (C.R. Acad. Sci. T. 208, P. 1802.) The tests were made on a brass sphere of 35 mm. diameter, over which a current of air was blown through a nozzle, designed to permit regulation of the air speed. Discharge of the sphere was measured with a gold leaf electroscope, the angle of its leaves determining the degree of discharge. For pressures up to about 2.1 atmospheres the discharge of the sphere speeded up as the pressure increased, along a practically rectilinear curve. From about 2.1 to 2.6 atm. the curve became a parabola, while beyond 2.6 atm. the curve again became rectilinear, with a much greater angle than the first part of the curve. These curves indicate a critical air speed of 410 metres per second, below which the speed of discharge may be considered as taking place slowly, but above which it increases very rapidly as the speed of the moving air current increases.

# PERSONAL AND SOCIAL

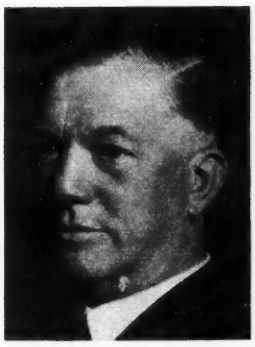
## Information regarding new appointments and other matters of interest for this page are welcomed

IMPORTANT Cabinet changes were made during last week-end, among them being the appointment of **Sir Andrew Duncan** as President of the Board of Trade and **Sir John Reith** as Minister of Information.

Sir Andrew, who succeeds Mr. Oliver Stanley (now Minister for War) has been associated with the basic industries for many years. He is chairman of the Committee of Con-



**Sir John Reith**



**Sir Andrew Duncan**

trol of the Ministry of Munitions Council of Supply, and is chairman of the executive committee of the British Iron & Steel Federation. As chairman of the Central Electricity Board from 1927 to the end of 1934, he played an important part in the organisation of the grid, and he is still a member of the Board.

Sir John Reith was the first general manager of the original B.B.C., and was Director-General of the Corporation from 1927 to 1938. In the latter year he became chairman of Imperial Airways, and subsequently chairman of the new British Overseas Airways Corporation.

**Mr. A. Pickles,** assistant sales manager of Birmingham Electric Furnaces, Ltd., left Birmingham on January 5th on the first stage of his journey to Sydney, where a new branch of the firm is to be established for the construction of electric furnaces in Australia. Mr. Pickles, who has been with Birmingham, Electric Furnaces, Ltd., for about ten years, is to be general manager of the branch works in Australia. Building operations have not commenced at Sydney, and some months will elapse before production is possible.

**Mr. H. P. Gaze,** M.Inst.C.E., M.I.E.E., chief generation engineer of the London Power Co., Ltd., retired on pension on December 31st, after forty-five years' service in the electrical industry. At a complimentary luncheon held at the Hotel Victoria Mr. Gaze was presented by his colleagues and the members of the staff with a Leica camera, and Mrs. Gaze received a gold wrist watch. Sir Leonard Pearce (the engineer-in-chief of the company), in making the presentation, paid a warm tribute to the services rendered by Mr. Gaze to the company and its predecessors, the St. James' & Pall Mall Co., and the Central Electric Co., his period of service with these companies amounting altogether to forty-three years.

*Elliott & Fry*

**Mr. H. P. Gaze**

Mr. Gaze has now joined Kennedy & Donkin, consulting engineers, in an advisory capacity on power station work.

**Mr. J. S. Morton,** A.M.I.E.E., recently retired from the position of mains superintendent with the Ashton-under-Lyne Corporation Electricity Department, after thirty-nine years' service, and was presented with an electric clock and smoker's cabinet from the staff of the undertaking. He is succeeded by **Mr. R. J. Nixon,** A.M.I.E.E., assistant mains engineer.

**Ald. R. Corlett,** J.P., who in November last relinquished the chairmanship of the Douglas Corporation Electricity Committee, which he had held since the inception of the Committee in 1920, was recently presented by the permanent officials of the Electricity Department with a walnut electric floor standard lamp and shade. Mr. B. G. Kelly, borough electrical engineer and manager, made the presentation.

**Mr. F. Jarrett,** secretary and managing director of Drake & Gorham, Ltd., completed fifty years' service with the company on December 28th. To mark the occasion a presentation was made on behalf of the directors by the chairman, Mr. R. H. M. Drake, and for the staff by Mr. W. Rogers.

**Mr. J. R. J. Bowden,** deputy borough electrical engineer of Hackney, is retiring in February, and at a meeting of the Borough Council this week the appointment of his successor is being considered.

A representative company from the mechanical and electrical departments of Ferguslie Thread Mills, Paisley, honoured **Mr. A. W. Johnston** on his retirement after twenty-two years' service as chief engineer. On behalf of the departments concerned Mr. W. Breckenridge presented him with an electric clock and for Mrs. Johnston a standard lamp. Reference was made to the many schemes for which Mr. Johnston had been responsible, notably the design and putting into service of the power station. Mr. Johnston is succeeded by **Mr. R. Bisset.**

Evacuated children who are the guests of **Mr.** and **Mrs. T. O. Callender,** at Bidborough Court, Bidborough, Kent, have devoted much of their spare time to handicraft work. Since the beginning of the war Mr. and Mrs. Callender have had twenty children from the Charlton Manor School staying at their home. Care has been taken to work in co-operation with the education authorities, while giving every encouragement for the development of the children's individual talents.

A Christmas Party and treat organised by Mrs. Callender with the assistance of a committee, of which Mrs. Hyatt-Wolf was chairman, was recently given at Bidborough Court. About 150 children were present, representing the Charlton

**Mr. T. O. Callender, a director of Callender's, and Mrs. Callender, acting as hosts to 150 evacuee children**

Manor School, the Charlton Open Air School and some of the children from Bidborough Village School. The entertainment gave the children a chance to display their many and varied talents, and it included carol singing, a scene from "Alice in Wonderland," a Nativity play, and folk and tap dancing.

## OBITUARY

**Mr. S. Hunter.**—We regret to learn of the death of Mr. Summers Hunter, which occurred on January 7th, at the age of seventy-four. Mr. Hunter was managing director of Richardsons Westgarth & Co., Ltd., and from 1908-10 was president of the North-East Coast Institution of Engineers and Shipbuilders, of which he was elected an honorary fellow in 1932.

**Mr. E. G. Roberts.**—We regret to record the death, which occurred on January 5th, of Mr. E. G. Roberts, South and East Coast representative of Albert C. Hands & Sons. Mr. Roberts had represented the firm for about twenty years.

**Mr. H. W. Gregory.**—The death has occurred at the age of fifty-three, at his home at Harpenden, Herts., of Mr. Hugh Welbourn Gregory, superintendent of the North-Western Area of the Northmet Power Company. Mr. Gregory was appointed resident engineer of the Northmet Co., at Wembley, in 1914, later becoming superintendent of the Western Area. He was a member of the I.E.E., and was the Institution's representative on the National Illumination Committee of Great Britain. For several years he was a member of the Council of the Association of Public Lighting Engineers. He also represented the Incorporated Association of Electric Power Companies on the Street Lighting Committee of the British Standards Institution.

**Mr. J. E. Dowson.**—*The Times* reports the death of Mr. Joseph Emerson Dowson, M.Inst. C.E., the inventor of the Dowson gas-producing apparatus and the first to apply producer gas to the working of gas engines. Born in 1844, Mr. Dowson received many awards from various institutions and societies, including a premium from the I.E.E.

# CORRESPONDENCE

***Every letter must be accompanied by the writer's name and address preferably, but not necessarily, for publication. The Editors cannot accept responsibility for correspondents' opinions***

## "Nobody's Babies"

SEVERAL correspondents have written to me asking "Who is Mr. Banks?" May I say that in addition to being the Employers' Industrial Adviser, he is also Secretary of the Employers' side of the National Joint Industrial Council and the National Joint Board. I would, therefore, not attempt to dispute his statements that I do "not realise the nature and elasticity of the N.J.B. Schedule" and that "the industry as a whole fully understands the position." I am, however, quite willing to leave the matter to the judgment of the industry as a whole which fully understands the position. There is no question of accommodating the views of my Association, but there is a question of accommodating those of the employees concerned.

Mr. Banks has thought it right to make reference to private correspondence between us; I may now state in case it may be of interest that the correspondence related to the Stretford and District Electricity Board and arose from a claim by my Association to secure improved remuneration for the installation inspectors employed by that body, whose wage packets contained the princely net sum of £3 3s. 4d. per week, a rate less than that of the journeyman. The service of these engineers ranges from 5 to 15 years, and their duties include testing and inspecting *all classes* of installations; readjusting prepayment meters; investigating faults and consumers' complaints; and advising consumers and contractors on all installation matters. The men have had a practical and technical training, and have qualified for membership of the Foreman Section of the A.S.E.E.

If, under the system which Mr. Banks defends, and on which he thinks it right to issue his dictum, such inadequate rates of pay can exist, then I hope "the industry as a whole fully understands the position" and what is being done in its name. No doubt the inspectors themselves have a point of view, and they have a right in these days of freedom to negotiate through the organisation of their choice, particularly when the machinery Mr. Banks upholds gives them rates of pay of which I feel confident "the industry as a whole" will not be proud.

It may also be of interest to record that a week ago I received a deputation of installation inspectors employed by a local authority who informed me that they had met representatives of the Joint Industrial Council and the N.J.B. and had been informed that neither of these bodies could do anything for them. Need I say more?

Mr. Milne, in his letter "The Reward of Ability," noted with downcast feelings the advertisement for a working foreman electrician at 1s. 6½d. per hour, and said: "It grieves me very much to know that some people put the same value on electrical engineers as on skilled labourers or policemen." Many will feel grieved that £3 3s. 4d. net per week is paid to engineers who must inspect and pass installation work carried out under the supervision of foremen and supervising engineers.

The A.S.E.E. has taken an interest in the conditions of employment of installation inspectors at the request of these employees, and not, as Mr. Banks's letter implies, to satisfy the Association. It would seem that the installation inspectors are still "Nobody's Babies," but I have no doubt Mr. Banks will appreciate that they will eventually solve the problem and secure for themselves conditions of service more in keeping with their responsibilities and duties. A. BRAMMER,

London, W.C.2, *General Secretary,*
*Jan. 8th.* Assn. of Supervising Electrical Engineers.

## Electricity in Ships

Referring to the article under the above heading in your issue of December 22nd, the new edition of I.E.E. Regulations for the Electrical Equipment of Ships is so monumental that one studies it with feelings of almost bewilderment. It is unquestionably an admirable piece of work upon which the Ships' Electrical Equipment Committee should be congratulated and thanked, but two conclusions are forced upon us in studying the rules, *viz.*: (1) That wholesale revision at intervals of ten years or so is most unsatisfactory, and (2) that regulations in such large quantities are apt to defeat their own good purpose.

With regard to the first a revision so extensive has obviously entailed a tremendous amount of work, and the range of subjects covered is so varied that one feels an element of doubt as to whether it has been possible, in a few months, to arrive at the unchallengeable conclusions that should be a *sine qua non* of such regulations. Again, the strain upon those who have to use and comply with the rules in their ships is very great indeed when such a comprehensive revision is issued. It seems to me, therefore, that revision of the rules should in future be a continuous process, in other words, that the I.E.E. should follow the same procedure as Lloyd's and issue once a year, to the sub-committees interested, a draft for comment of proposed alterations and adjustments. By this method it is possible to give every small revision meticulous and individual attention, a number of opinions from practical men can be collected for submission to the main committee, and the revisions adopted, being few in number at a time, stand out clearly to those who have to memorise them.

Coming now to the second point, it will be noted that the increase in number in this third division is from 271 rules in the second edition to 618 rules in the third edition, plus sections, tables, appendices, and 59 British Standard Specifications. The second edition appeared to be full and complete, so complete, in fact, that the rules were not adopted in their entirety by the Classification Societies.

In addition to these rules, ships' installations are controlled by a very large number of Board of Trade regulations, scattered throughout numerous books, pamphlets and leaflets; Classification Societies' requirements (modified I.E.E. Rules it is true but none the less importantly modified sometimes); and various foreign regulations that have to be complied with sometimes even on British ships, as well as on ships for foreign registration. Is it probable that one human head can be depended upon to keep all that sum total constantly in view? Yet a draughtsman designing the electrical systems of ships must know them almost by heart and the foreman in charge of the installation work must watch them almost as carefully. It will be realised that it is not every man who is patient enough to tackle the heavy task of studying them and one could wish for something easier to memorise.

One further suggestion might be made and that is that the Classification Societies should adopt these rules as they stand and thus avoid having two sets of rules very nearly, but not quite, alike. The only thing against this is the serious question of the cost of British ships as compared with those built to a lower standard in foreign yards. H. C. MACEWAN.

Belfast, *December 30th.*

## Proposed Sales Staff Association

I would like to appeal through your columns to all members of electricity supply authorities (municipal and company) employed on the commercial side, i.e., sales representatives and showroom and office staffs to form an association that would have as its main objectives: (i) Improved status in the industry; (ii) promotion by merit as well as by years of service; and (iii) increased maximum salaries. The membership would be limited by age (not under 21) and bona-fide qualifications (such as the E.D.A. certificate).

Since war broke out the status of the sales engineer has been reduced to nil. In many instances he has been dismissed and in others relegated to the position of slot meter collector. Showroom positions continue to be advertised at ridiculously low salaries.

A national effort is needed to put these matters right. I would be glad, therefore, to hear from any responsible readers willing to form the nucleus of a committee for this purpose. Regional groups should be started all over the country to obtain a large membership as quickly as possible with a co-ordinating centre in London or the Midlands.

Leamington Spa, *January 5th.* ROBERT E. PAGE,
(late County of London Electric Supply Co., Ltd.).

## High-voltage Generation

In a leaderette in your issue of December 15th, relating to a paper by Mr. W. D. Horsley, you refer to the very successful results which have followed the introduction of high-voltage windings on alternators.

This development was based in principle upon the methods described in a paper that I read before the I.E.E. towards the end of 1922. The principle was that of a double-concentric conductor, the lead sheath being earthed and the intermediate and the innermost cores being held rigidly at fixed potentials by suitably connected transformers thus avoiding the non-uniform potential gradients and unnecessary stressing of the innermost insulation and making the outer layer do more "work." Alternator windings were not mentioned in the paper specifically, but the application was tolerably obvious.

Birmingham, *January 6th.* A. M. TAYLOR.

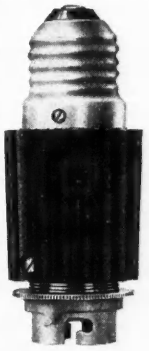
# NEW ELECTRICAL PRODUCTS

## A Review of Equipment Recently Marketed

### Lighting Adaptors

FOR use in industrial and commercial premises where it is desired to alter existing fittings to comply with A.R.P. requirements by reducing the lighting intensity, a range of adaptors, converting from g.e.s., e.s. and b.c. respectively to b.c., and providing extensions of 4, 3½ and 3 in., has been designed by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2. Each of these adaptors has a body of brown porcelain, which is fluted to facilitate turning and fitted at the top end with the appropriate lamp cap and at the bottom with a b.c. lampholder and shade ring.

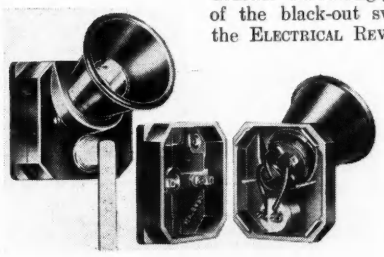
For use in fittings in which no variation of lamp cap position is necessary, the company has introduced another type of adaptor consisting of a brass shell with a g.e.s. external thread and an e.r. internal thread. This enables existing lamps of 300 to 1,500 W rating with g.e.s. caps to be replaced quickly by 15- to 150-W lamps with e.s. caps.



**G.E.C. e.s. to b.c. adaptor**

### Black-out Switch-dimmer

Under certain conditions the complete extinction of the light when an outside door is opened may be unnecessarily drastic. Accordingly, as a development of the black-out switch described in the ELECTRICAL REVIEW on September 22nd, J. A. CRABTREE & CO., LTD., Lincoln Works, Walsall, have now introduced an automatic switch-dimmer which, besides switching off the main light when the door is opened also switches on a dimmed light. This switch-dimmer combines a lampholder, switch and all the necessary interconnections in a compact unit. Easily removable "knock-outs" in the base make the switch suitable for either surface or back entry wiring.

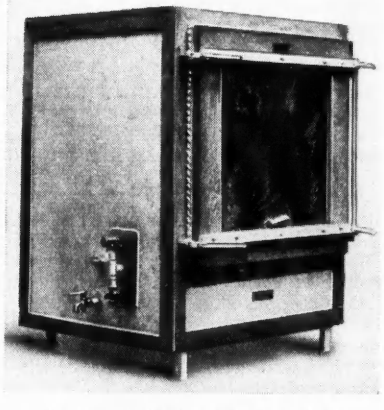


**Crabtree switch-dimmer**

All that is necessary to insert the switch-dimmer in a one-way lighting circuit is to interrupt the lamp wire at the ceiling rose and lampholder terminals and run twin cable back to the switch-dimmer and connect it to the terminals provided. This provides a special dimming circuit which comes into operation only when the door is opened. The unit is designed to project the light upwards and a soft, diffused glow is obtained. Moreover, a standard b.c. lampholder permits the amount of illumination to be varied as required.

### Sterilising Chest

AVELING-BARFORD, LTD., Grantham, have redesigned their electric sterilising chest so that in addition to its improved efficiency as a sterilising unit, 10 gal. of boiling water can be drawn off for washing-up purposes. When used for sterilising an automatic device controls the water level so that only sufficient water for the purpose is admitted to the container and also prevents the container from becoming empty. For heating water for general use, another control is brought into action which renders the control valve for the low level ineffective. The chest is lagged, covered with galvanised steel sheet and panelled with teak wood framing.

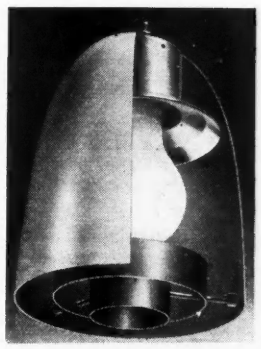


**Aveling-Barford sterilising chest**

To enable a steaming stool, or a steam jet for milking machine tubes to be operated from the chest, the steam supply connection is fitted with a two-way cock. Chests are constructed in sizes from 12 to 75 cu. ft. capacity and are loaded from 4 to 15 kW according to size, the immersion heaters incorporated being easily accessible by means of a removable panel at the front. A new type of door fastener enables the door to be swung open from either side or, alternatively, lifted right off. A draining rack and a dial type thermometer are supplied as standard equipment.

### A.R.P. Lighting Units

The new "Teeanee" A.R.P. screened lighting units made by TUCKER & EDGAR, Berkeley Works, Berkeley Road, London, N.W.1, incorporate louvres designed to cut off a wide-angle view of the lamp and to give proper light control with a cut-off of 40 deg. The dome-shaped housing is of heavy gauge steel or copper and is ventilated, provision being made for a b.c. lampholder for flex suspension in all three of the sizes available. The fittings are intended for use with 25-, 60- and 100-W pearl or blue colour sprayed lamps. Nine colour finishes are available, the interior and louvres in all cases being black. The units are especially useful for offices, shops, and factories, as well as in the home for halls, corridors, etc.



**"Teeanee" screened lighting unit**

### A Low-priced Cleaner

A low-priced vacuum cleaner of the upright type is announced by A. C. COSSOR, LTD., Cossor House, Highbury Grove, London, N.5. Sturdily constructed, this "Junior" model 808 unit has a highly polished streamlined aluminium body mounted on four rubber wheels and fitted with a powerful ball-bearing motor that needs no oiling. A well-designed nozzle, 8½ in. wide, can be adjusted to any desired height from the carpet, while a special sweep-action brush removes hairs, cotton, &c. A rubber bumper protects furniture.

The large-capacity dust-bag has a slide-off top clip to facilitate emptying, and the one-piece handle shaft has a comfortable grip with a conveniently placed switch. A dual connector is provided on the 15 ft. of heavy braided cable. A complete set of accessories is available.

**Cossor "Junior" cleaner**

### Improved Distribution Equipment

By introducing new angle sealing boxes for use with dwarf units, W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., Milton Court, Westcott, Dorking, has made it possible to reduce the depth of excavation considerably in comparison with that necessary with the usual straight sealing box, or to dispense with the need for a raised concrete base to allow for the bending radii of the cables. The box is reversible and can be employed for cables coming in at either the front or back of the overground disconnecting box. The angle of the box is 35 deg. to the vertical. The boxes can be fitted with various types of gland, including a new bolt-on brass wiping gland which has a wide flange at the top and is clamped to a ground face on the sealing box by a cast-iron ring secured by four bolts. The gland is a hot brass pressing and is of the universal type with a tapered portion, which is stepped to facilitate cutting.

## An Electric Fence

Fencing costs as well as time, labour and materials, are considerably reduced by the use of an electric fence such as the "Parmak" marketed in this country by the WOLSELEY SHEEP SHEARING CO., LTD., Electric Avenue, Witton, Birmingham. This device, which necessitates the use of only one wire, is operated by means of a 6-V accumulator connected with a primary coil creating a magnetic field. This in turn causes a static current to be produced in a secondary coil sufficient to give a sharp but harmless sting to anything touching the wire.

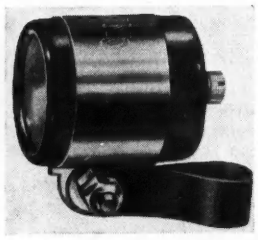
**Controller of the "Parmak" electric fence**

A contact breaker causes electrical impulses along the fence wire at the rate of about 50 a minute, each impulse lasting about 0.001 sec. This, in conjunction with a resistance, acts as an additional safety feature. By a simple adjustment a constant current is made to flow under all soil conditions.

One apparatus charges several miles of fence and a single accumulator lasts for a considerable period. Not only do horses, cattle and pigs learn by experience to respect the fence but fields are said to be kept completely free from rabbits.

## Cycle Rear Lamp

Recent regulations make it compulsory for cyclists to fit rear lamps. To help to meet the big demand thus created for this accessory, GRAHAM FARISH, LTD., Bromley Kent, have just brought out the neat "Formo" lamp finished in black enamel with a plated band round it. A swivel mounting facilitates fixing, the terminal being conveniently placed at the back.



**"Formo" cycle rear lamp**

## Coil-winding Machine

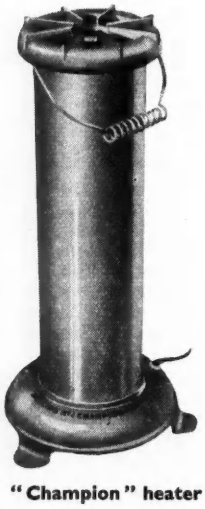
A simple machine for winding small bobbins or electrical coils with only a few turns and also for larger wire sizes not catered for by automatic machines is now available from FRANK WHITELEGG, 90, Robinhood Lane, Sutton, Surrey. It is geared 1:2 but direct 1:1 drive can be obtained by altering the position of the handle. A simple counter is standard, a resetting device being an extra.

## Special Purpose Heaters

Two electric heaters intended to meet special wartime demands have been produced by BELLING & CO., LTD., Bridge Works, Southbury Road, Enfield.

The need for economising electricity whenever possible should produce a ready sale for the "Dandie" model which is fitted with two firebars, each using 500 W. One bar is sufficient to keep a small room warm once the temperature has been raised. The fire, which is of modern design, weighs 7 lb. and is easily carried by means of a handle which drops out of sight when not in use. Antique copper and silver are the finishes available.

The other heater, the "Champion," designed after the style of the popular oil stove, is especially suitable for A.R.P. shelters, wardens' posts, halls, small bedrooms, passages, doctors' consulting rooms, &c., and for keeping frost out of garages, greenhouses, &c. The elements, which are loaded at 750 W, are arranged in the form of a cone, warm air being circulated throughout the room and avoiding stagnation. Food can be kept warm on the top and a kettle can be boiled. The unit takes up very little space, is safe, and can be placed close to fabrics and furniture without risk of scorching them.



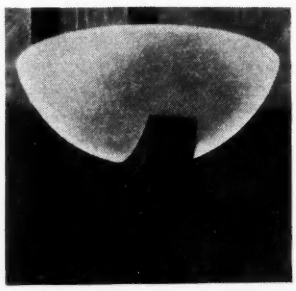
**"Champion" heater**

## Shop Window Lighting

Special attention to case of packing has been paid in the new "Harco-Windo" lighting box which HARCOURTS, LTD., Stanhope House, 1, Kean Street, Aldwych, W.C.2, have just produced to conform with the new Regulations for shop window lighting. By constructing it of four separate components it is possible to pack four times as many boxes unassembled as it would if they were sent out complete.

## Wall Brackets

Wall brackets are being found very useful, not only for giving local light only where required and so saving electricity, but also for assisting in securing an effective black-out of a room. For the latter purpose it is desirable that the shade should consist of a material giving good diffusion. "Vitreosil" is such a material, and the manufacturers, the THERMAL SYNDICATE, LTD., Wallsend, Northumberland, have now developed a special unit for this purpose. The support is of stained oak in Jacobean finish, while the shade has a characteristic grained outside surface giving a very pleasing effect and, as no piece of "Vitreosil" is exactly like another, an individuality is obtained. This is also true of the interior surface which is lustrous and acts as an efficient diffuser, giving even distribution of the reflected light.

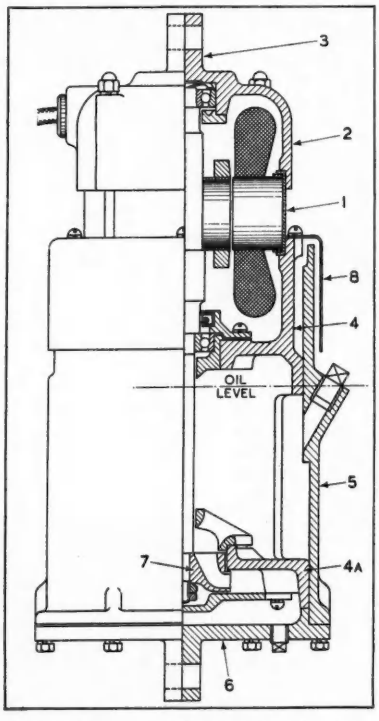


**"Vitreosil" wall bracket**

## Small Thrustor

A small electro-hydraulic thrustor has been introduced by the BRITISH THOMSON-HOUSTON CO., LTD., for loads requiring a thrust of not more than 40 lb. through a 2-in. stroke when the dimensions of the previous smallest size of thrustor (rated 75 lb. through a 2-in. stroke) would make it unsuitable.

The number of parts involved has been reduced to the minimum by dispensing with the push-rods and cross-bar, and building the motor endshield in one casting with the piston, the pressure from the piston being transferred to the top clevis through the motor casing.




**Construction of B.T.H. small thrustor**

Referring to the diagram, the motor stator (1) carries the top endshield (2), and the top connecting lug (3) is cast solid with this. The lower end of the stator shell is in the endshield (4) and the piston (4a) is cast in one piece with this endshield. The piston slides in the tank (5) and the bottom of the tank (6) carries the lower mounting clevis.

The impeller (7), mounted at the lower end of the motor shaft, generates a pressure below the piston when the motor is running, so that the piston and the complete motor are forced upward, the impeller pumping the oil from the top to the bottom of the piston until the upper limit of travel is reached. If the motor is still energised, the impeller will maintain a pressure below the piston so that the latter is maintained in the top position. The cover (8) prevents dirt from falling into the tank and at the same time allows free movement of air inside the tank as the piston rises or falls.

# PROSPECTS IN MADRAS

## Expansion of the Government System

UP to the present the Government of Madras Electricity Department has been largely concerned with meeting the industrial load—particularly textile—which has been primarily responsible for the rapid expension in output from 10.9 million kWh in 1933-34 to 131.1 million kWh in the past year. For the future, however, development will depend more and more upon an improvement in the agricultural and domestic demands. In regard to the former, good progress is being made, with an increase in the number of pumps connected during 1938-39 from 970 to 1,429 (Pykara system) and from 19 to 64 (Mettur system).

Nevertheless, circumstances are not altogether favourable to electrical development generally, particularly in licensees' areas. Some of the factors which tend to impede the natural growth of the demand are mentioned by Sir Henry Howard, Chief Engineer (Electricity), in his report for 1938-39. Among these are a widespread and often unreasonable agitation for reduced charges, particularly for street lighting; discouragement of village lighting; resolutions of local authorities against the use of small industrial motors, combined with a reluctance to grant licences for them; difficulties in getting electric drive for public waterworks; inability of some licensees to raise additional share capital; and unwillingness to develop rural areas.

The Government Electricity Department is formulating proposals to remove such obstacles, and is also carrying out considerable propaganda by way of posters and exhibitions. It is felt, however, that a commercial department is needed to organise propaganda in a systematic manner, as the existing staff is inadequate to undertake the work.

Discussing the prospects of hydro-electric development, Sir Henry points out that Madras possesses no sources of cheap power such as exist in Norway and Canada. He therefore considers it prudent to leave the large-scale manufacture of fertilisers, chemicals and the electric smelting of ores, which require large amounts of power at low rates, to other parts of the country.

### Difficulties Overcome

In the field of generation the past year has not been without its difficulties. At one time there was anxiety over the Department's ability to meet the peak load, due to delay in the delivery of additional equipment at Pykara, but the plant withstood the strain satisfactorily without serious restriction of service. Early in the year, also, the Mettur station was out of commission for a month through an 18-in. drain valve bursting and flooding the station to a depth of 10 ft. The emergency was met with very little loss of revenue, and Sir Henry specially acknowledges the helpfulness of Associated Electrical Industries (India), Ltd., whose engineer was mainly responsible for rehabilitating the plant.

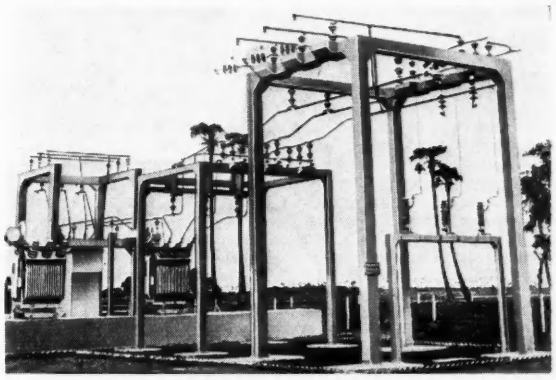
A number of important schemes were carried out during 1938-39, the cost of the materials purchased by the Electrical and Mechanical Division being Rs.34,11,300, of which British supplies accounted for 28 per cent., Indian products for 30.4 per cent., and foreign equipment for 41.6 per cent., excluding spares for the Pykara and Mettur systems covered by English indents for £2,337.

For economy and to use indigenous materials reinforced concrete construction has been extensively employed both for transmission line poles and sub-stations. For the Virudunagar-Koilpatti 66-kV line and the 33-kV lines in the East Ramnad area reinforced concrete poles have been used and many of the 66-, 33- and 22-kV sub-stations recently constructed at Villupuram, Koilpatti, Virudunagar, Conjeeveram and other places are of reinforced concrete. The accompanying photograph shows the 33-kV sub-station at Conjeeveram. It is stated, however, that while reinforced concrete construction may be considered satisfactory for sub-stations, its economic utility for transmission line supports has, to date, been disappointing.

Of the works included in the 1939-40 programme the most important is the Papanasam hydro-electric scheme on which, at the end of March last, a labour force of 3,500 was employed. Preliminary work is nearly finished on the installation of a fourth set at Mettur, and it is also proposed to install further plant at Bezwada and Vizagapatam. Small thermal schemes are also in hand at Cocanada, Nandyal, Tadpatri and Madanapalle, and another is envisaged at Palacole. To provide additional generating capacity required before 1944 it is proposed to investigate the Moyar scheme, a new dam for the Pykara system, and the Thalipuzha, Silent Valley, Bhavani and Kundah projects.

With regard to transmission, it is thought possible that tenders for the West Coast extension may be invited before the end of the financial year, while a report is being presented on the economic merits of a line extension to Madras city.

There was a rather alarming jump in the number of electrical accidents in 1938-39, when the total was 138 compared with 79 in the previous year and 77 in 1936-37. Of the 48 fatal accidents, 38 were the result of people climbing overhead line poles, either through curiosity or with the intention of committing suicide.



**Reinforced concrete sub-station construction at Conjeeveram**

## Shock Therapy

ELECTRICALLY induced convulsions in the treatment of mental disorders have been discussed on several occasions recently in the medical journals. For some years psychiatrists have claimed that sudden and disturbing physical or mental "impacts" can be applied with specific remedial intent to alleviate disordered states of the mind.

In attempts to avoid the disadvantages, risks and after-affects of treatment by drugs electric shocks are being now substituted, according to the method first devised in Italy by Cerletti with his assistant Pini and pupil Chiauzzi at the Rome clinic and at Genoa. Details of the method as practised in this country, at the Warlingham Park Hospital, are given in the *British Medical Journal* for December 30th.

Fifty major fits appear to have been induced without untoward occurrence, at from 90 V (passing 600 mA through the head of the patient) up to 145 V, the duration of the shock being from 0.1 to 0.2 second. The apparatus as made by a British firm, the Solus Electrical Co., Ltd., incorporates refinements not mentioned in the original Italian patents. It can be made light and portable, consisting of two independent electrical circuits, with electrodes which require to be carefully placed in close opposition over the head at the junction of the temporal and parietal bones. A low-voltage DC potentiometric circuit is first used to measure the resistance through the patient's head. This is of the nature of a calibration, assisting in the choice, but not entirely determining the shock voltage to be applied. The latter is obtained from an AC mains energised auto-transformer, tapped for adjustment between 50 and 150 V output and able to deliver up to 2,000 mA. The duration of the shock is automatically limited by an adjustable time switch; a ballistic method of directly reading the current flow is employed; adjustment of shock voltage can be pre-read on a voltmeter and means of compensating for mains fluctuation are provided.

Definite statements regarding therapeutic results have not yet been made, but the electrical method is expected to compare favourably with others. Its chief advantages seem to be instantaneous loss of consciousness and absence of certain of the recovery symptoms, so reducing fear of further treatment. While the disturbance of electric shock not severe enough to kill may be regarded as transitory and mild in nature, what is likely to be the effect of frequent repetition of convulsions induced in this manner, sometimes to the extent of four or five at a single session? In counselling caution before the electrical method is allowed to become the "fashionable" treatment for severe psychoses the *Lancet* appears to hint at a risk of slow development of abnormality.

# COMMERCIAL and INDUSTRIAL NEWS

## E.D.A. Wartime Activities. American Cable Standards. A.R.P. Lighting Set. The Norwich Appointment. E.A.W. Programme.

### E.D.A. in Wartime

IN our leading article this week we give an outline of the work which the British Electrical Development Association is doing at the present time; the following notes add some details of these activities. One of the most busy of the Association's committees is that dealing with rural electrification. Among the principal matters which it has under consideration is the possibility of a national scheme for the provision of electricity supply to all farms. The use of electrical equipment on poultry and dairy farms is receiving particular attention. Much help has been given to members in the matter of street lighting and in the equipment of air-raid shelters with electric lighting, heating and ventilation. Although the E.D.A.-E.L.M.A. lighting campaign was checked by the outbreak of war the factory lighting side is being actively pursued. The manual mentioned in our leader is really a valuable guide to works lighting and likely to produce much better results than mere unsupported propaganda. The new films are headed by "The Village that Found Itself," a story of rural electrification possessing "human interest." It runs for half an hour and is considered suitable for inclusion in an ordinary cinema programme. "Hot Evidence," running from 12 to 14 minutes, deals with electric water heating. Four short films (1 to 1½ minutes) are claimed to be far superior in technique to the generality of publicity films and should be acceptable to the cinema goer.

A wartime cookery book has been produced. It gives a hundred recipes which pay due regard to rationing, to small incomes and to the special needs of evacuated children. "Electrical Housekeeping" is still being published and the demand for it is being maintained.

The Association's aid to the Building Centre in the way of staff is being continued and a series of special exhibitions is being organised at the Centre. It is proposed to hold the first of these during this month. Supply authorities are continuing their hire schemes to a far greater extent than is generally supposed and it is hoped that the Government's new attitude towards the building industry will lead to a greatly increased demand for cookers, water heaters, &c.

### Display Material in Wartime

When the war started the reactions of the advertising display industry were not very encouraging, and many schemes in hand were abandoned. One encouraging example of a refusal

**"Osram" linen folding display unit**

to submit to circumstances, however, is provided by the General Electric Co., Ltd., which during the past six or seven years has built up a very comprehensive service. The "Osram" national window display scheme was due to commence on September 4th—the day after the outbreak of war, and the company decided to continue with the scheme despite the changed circumstances. It should encourage others to note that, not only has the plan been successful, but it has been more successful than ever before, and has added considerably to the company's prestige.

As the displays had already been manufactured, the plywood shortage presented no initial troubles but it was anticipated that during the second half of the season these were likely to arise. The company has, however, produced a display which is almost independent of the use of plywood. This comprises a linen screen which is printed by the silk-screen process. A feature of this unit is the method by which the linen is stretched so that it remains absolutely taut when installed in a window, the stretcher being designed in consultation with Displaymakers, Ltd. This display is less expensive than the normal plywood type. The overall dimensions are 4 ft. 6 in. by 4 ft. It is collapsible, and can be packed into a case measuring only 4 ft. 6 in. by 3 in. by 7½ in. reducing carriage charges and making it easier for the window dresser to handle. Two four-colour designs will be used and from the beginning of January until the spring these will be installed in numerous dealers' windows all over the country.

### New American Cable Standards

Many changes have been made which improve the accuracy and extend the scope of various sections and tables of the new edition (fourth) of the "Specifications for Varnished Cambric Insulated Cables," recently issued by the American Insulated Cable Engineers' Association. This new specification, while following along the general lines of the third edition, contains a number of changes, the most important of which is probably the appreciable increase in the maximum operating temperature permitted. The maximum copper temperature now specified for cables operating at 5 kV or less is 85 deg. C., while for cable of higher voltage the limiting temperature is only slightly below that specified for paper-insulated cable for the corresponding voltage rating. This represents an increase of from 8 to 15 deg. C. above the limiting temperature given in the third edition of the specifications. Other important changes include a reduction in power factor of the insulation for both single- and multiple-conductor cables. This reduction is between 30 and 40 per cent. at the higher temperatures and somewhat less at intermediate and lower temperatures.

### Employment in November

Employment in the engineering, shipbuilding and other metal industries between October 16th and November 13th showed a slight improvement, and there was little change in electrical engineering. The percentage of unemployed in the engineering industries as a whole was 3.4 per cent. at November 13th as compared with 3.6 per cent. a month before and 8.1 per cent. at November 14th, 1938. The number out of work in electrical engineering was 3,183, or 2.6 per cent., being a decrease of 0.1 per cent. as compared with October and a fall of 2.7 per cent. as compared with November, 1938. In the electrical wiring and contracting industry, there were 3,378 unemployed, the percentage falling from 8.2 per cent. to 7.9 per cent. (9.6 per cent. in November, 1938). The total out of work in the electric cable, apparatus, lamps, &c., group was 9,388, the percentage remaining at 5.1 as compared with October (6.7 per cent. in November, 1938).

### Excessive Prices for Steel

At Birmingham on December 3rd Morley's (Birmingham), Ltd., were fined £25, with £3 3s. costs, for offering for sale corrugated sheets at prices greater than those stipulated in the schedule of maximum prices issued by the Iron and Steel Control. It was alleged that the company quoted Stewarts & Lloyds, Ltd., £24 per ton for second-grade sheets, the maximum price for which was laid down at £16 15s. Morley's, who pleaded guilty to the charge, had alleged that they had had to pay more than the stipulated prices for their supplies, which counsel for the prosecution pointed out was also a contravention of the Order. The defence was that the cost of processing the flat sheets sent the cost up to £22 or £23 per ton and therefore £24 per ton for the finished product could not be considered excessive.

### Trading with the Enemy

The Board of Trade has issued the Trading with the Enemy (Specified Persons) (Amendment) (No. 4) Order, 1939 (Stationery Office, 6d.). This revokes previous "specified persons" Orders made under the Trading with the Enemy Act and contains the names of a large number of firms and individuals in all parts of the world with whom commercial transactions are forbidden.

### American Radio Agreements

The Radio Corporation of America has entered into new licence agreements with the American General Electric Co. and the Westinghouse Electric & Manufacturing Co., which are supplementary to the licence agreements that have existed between the companies since 1932, reports *Reuter's Trade Service* from New York. The new arrangement was considered desirable because of the expanding research and engineering activities of the three companies, which provided new fields for the application of radio and electronic devices. In general the R.C.A. has acquired from the other companies the right to sell and to grant licences to others for the sale of most types of radio valves for all uses and has also acquired the

right to sell associated apparatus for many applications. Under the agreement, General Electric & Westinghouse receive from the R.C.A. the right to sell equipment, including valves for many radio applications, such as broadcasting transmitters, television and facsimile apparatus and airport equipment. The new agreement widens the scope of activities of the three companies by giving to each a broader market for its products and services.

### Company Reconstruction

The Alliance Electrical Co., Ltd., informs us that it has decided to reconstitute the capital of the company. This will necessitate placing the old company into voluntary liquidation and the registration of a new company under the same name, the directors of which will remain as at present.

### Scottish Contractors' Year Book

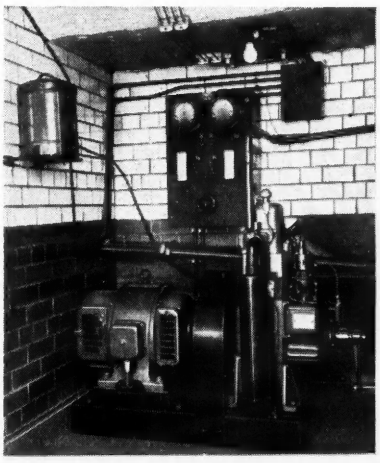
The 1940 edition of the Year Book and Diary of the Electrical Contractors' Association of Scotland (3s. 6d. post free) contains most of the features which have made this publication indispensable to those engaged in electrical contracting work in Scotland, but war conditions have made it necessary to omit certain features. As in previous editions the information given is preceded by portraits of the president (Mr. H. W. Speirs), the vice-president, branch chairman and the general secretary. An alphabetical list of members, with addresses, is included, and among the many features is a list of Scottish electricity undertakings, giving voltages and electricity charges.

### Post Office London Directory

The evacuation of business firms from London created many difficulties in the preparation of the 1940 edition of the Post Office London Directory (Kelly's Directories, Ltd., 186, Strand, W.C.2, price 60s.). These, however, have been successfully overcome, and anticipating that in the vast majority of cases this migration will prove to be only temporary, the publishers have for this edition included in the commercial (alphabetical) section emergency addresses both in outer London and in the country. The renaming of streets by the L.C.C. has again caused a large number of alterations in all sections. The directory retains its usual features, including the Streets Section.

### A.R.P. Lighting Set

The accompanying illustration shows an interesting generating set which has been installed in a large northern tobacco factory for air raid shelters which are in the basement of the premises. It has been provided to guard against black-out through failure of the Corporation supply. The set consists of a Crompton Parkinson DC generator of 5 kW capacity directly coupled to a Crossley vertical single-cylinder four-stroke Diesel engine of 10 HP at 1,500 RPM. The engine is of the latest Crossley pattern incorporating a "Ricardo" design cylinder head, and is of the cold starting type when using the usual grade Diesel oil. The crankshaft is carried in roller bearings of generous dimensions and lubrication is by positive plunger pump.



**Crompton Parkinson generator directly coupled to a Crossley Diesel engine for air raid shelter lighting**

### Progress in 1939

The 1939 output of Crossley-Premier gas and oil engines is particularly notable, both for the large output of some of the major units and also for the number of engines often ordered by a single client. Among the orders was one for eleven oil engines, ranging from 100 to 400 BHP, for pumping duties in the Eastern Counties. Another group of 1,100 BHP convertible gas oil engines were supplied for mining work, to West African companies. In the Near East the tin mining industries took delivery of five Crossley-Premier horizontal engines of 400 BHP each, these being required for driving alternators. Three other large horizontal gas engines of the vis-a-vis type, were dispatched to Eastern Europe. These units, each of 1,200 BHP, were also intended for alternator drive. One contract of particular importance was for a 3,000 BHP oil gas convertible engine delivered to a steelworks in the Midlands for driving an electric generator.

### Modern Workshop Lighting

There are few trades in which good illumination is more essential than in tailoring, especially when work is often with dark thread on dark material. The tailoring workroom at the Liverpool store of Lewis's, Ltd., is an excellent example of how a modern workroom should be lighted. The scheme is by Benjamin fittings, R.L.M. reflectors at a height of only 9 ft. above the floor providing an illumination of about 15 ft.-candles. This installation ensures a high standard of work together with a good output.

**Benjamin reflectors in a workroom of Lewis's Ltd., Liverpool store.**

### New Zealand Electrical Purchases

The bulk of the purchases by the New Zealand Government in Great Britain during December, amounting in value to £86,000, comprised electrical machinery and equipment.

### Palestine Import Licences

A Licensing of Imports Order was issued on December 11th by the Palestine Government prohibiting the importation of many classes of goods except under licence. It does not apply to goods shipped to Palestine before the date of the Order. The following electrical products are included in the schedule:—Welding machines and parts; "insulated pipes and lead pipes for electric wiring"; pocket lamp and torch batteries; insulated cable and wire; electric cooking stoves; glow lamps; lighting fittings wholly or mainly of metal; meters; refrigerators and parts; radio sets and parts; electrical goods and apparatus not elsewhere specified; and electrical machinery for light and power.

### The "Henley Telegraph"

The latest issue of Henley's staff magazine is termed an "emergency issue" but it maintains the usual high standard. In it are described the arrangements made for carrying on the company's business in wartime, including the evacuation of headquarters to Milton Court, Dorking. The pictures of that delectable district suggest that the inconveniences of moving were not without a certain measure of consolation.

### Long-service Oil Engine

The first commercially produced oil engine sent out from the Grantham Works of Ruston & Hornsby, Ltd., has just been returned. This engine was delivered in May, 1892 and was built from the patents of Herbert Akroyd-Stuart. It was erected at Fenny Stratford waterworks with another similar engine in a pumping station of the Bletchley Urban District Council. Both engines were in service at the waterworks until 1923 when both were superseded by more powerful and up-to-date engines. The engine which has just been returned to Grantham was bought from the U.D.C. by a timber merchant in Bletchley who used it until quite recently.

### Consolidation of U.S. Cable Companies

A *Reuter* message from New York states that the Federal Communications Commission has recommended to Congress the consolidation of the Western Union Telegraph Co. and the Postal Telegraph and Cable Co., as a remedy for the many existing ills of the communications industry.

### High-voltage X-ray Tube

With the object of extending its research work in the high-voltage field to higher levels the U.S. National Bureau of Standards has recently ordered from the American General Electric Co. a ten-section, 1,400,000-V X-ray tube, claimed to be one of the highest voltage X-ray tubes ever made. With the new outfit the Bureau will be able to enlarge its work in the measurement of X-ray dosage, and the equipment can also be used for the production of neutrons and artificial radioactivity. The tube is rated at 10 milliamp. It will be mounted vertically, stand 28½ ft. in height, and the glass envelope will be mechanically shielded against breakage by means of a series of corona shields of spun aluminium. To operate the

tube at any voltage from 300,000 to its upper rating a constant-voltage DC generator, composed of step-up transformers, capacitators and kenotron rectiner tubes, is being constructed. It will consist of ten sections, each rated at 140,000 V, connected individually to the ten sections of the tube.

### Red Cross Appeal

As we have already reported, the Red Cross Society and the Order of St. John, with the approval of the Government, are combining their resources for the care of sick and wounded combatants and co-ordinating all voluntary offers of assistance. Help from the public is needed both in cash and in kind. Money gifts should be sent to the Lord Mayor of London, Mansion House, E.C.4, addressed Lord Mayor of London's Red Cross and St. John Fund. Gifts in kind will be welcomed by Lord Ebbisham at 54, Victoria Street, S.W.1.

### Two Year Books

The 1940 edition of the Mechanical World Year Book (Emmott & Co., Ltd., 31, King Street West, Manchester, 1s. 6d. net) contains a number of new and interesting features. There is an entirely new section on steam boilers, and the accompanying sections on boiler construction and boiler mounting, fittings and instruments, have been brought into line with this new work wherever progress has indicated the need.

"The Electrical Year Book, 1940" (Emmott & Co., 1s. 6d. net), in addition to the features of previous editions, contains new sections dealing with electrical methods of measuring temperature (including pyrometers and distance thermometers) and electric braking (for DC and AC motors). New matter is also included on crawling and single-phasing of induction motors, and on 3-phase commutator motors. The various sections have been brought up to date, the tariff section including new matter on the block tariff. Additions have also been made to the matter on trolley buses, supply systems, railcars, Diesel-electric locomotives and automatic sub-stations.

### E.A.W. Programme

In spite of the war, the Electrical Association for Women is carrying on actively and the London branch has arranged an interesting programme for the Spring. As many members are, however, busy on war work of various kinds, fewer meetings have been arranged, but these are practical or provide much needed relaxation. On January 16th Mr. Norman Leevers will lecture on "The Roving Microphone," while on January 31st there will be a reunion party at the clubroom. At the annual general meeting on February 21st, Miss Caroline Haslett, the director, will give an address. "Electrical Aids to Health and Beauty" will be the subject of a talk by Madame Shackleton on March 11th, and during a visit to the showrooms of Harcourt, Ltd., on the following day, Mr. J. B. Harris will give a demonstration of fluorescent lighting. A talk entitled "In the Kitchen" will be given by Miss Dorothy Vaughan on April 2nd, and the Association's annual general meeting and luncheon will be held on April 18th.

### Prohibited Imports and Exports

The Import of Goods (Prohibition) (Consolidation) Order issued by the Board of Trade brings into one document the classes of goods specified in previous Orders. The importation of any of these goods is prohibited except under licence unless they are consigned from the Channel Islands.

The Export of Goods (Control) Order published this week is also in the nature of a consolidating Order. It revokes and replaces the Export of Goods (Prohibition) (No. 2) Order and amendments. The li ensing requirement for electrical generators, transformers and switchgear is maintained.

### Change of Address

The High Conductivity Copper Association is reopening its headquarters at High Holborn House, 52-54, High Holborn, London, W.C.1 (telephone: Chancery 8561-3), to-day (Friday), and the temporary address at "Bealings," Stansted, Essex, is being discontinued.

### The Norwich Appointment

It will be recalled that when the Norwich Corporation advertised recently for a city electrical engineer at a salary of £1,500, rising by two annual increments to £1,700, the Associated Municipal Electrical Engineers and the E.P.E.A. advised their members not to apply for the position, claiming that the commencing salary should be £1,700. At a meeting of the City Council recently, however, it was decided that the Electricity Committee should proceed with the appointment of an engineer at the advertised salary.

### Canteen Electrical Equipment

Mr. L. W. George, borough electrical engineer, 87, Victoria Road, Aldershot, asks for catalogues with illustrated details and prices of electrical equipment for snack bars and canteens.

### Prices of Materials

Henry Gardner & Co., Ltd., report, January 10th:—No change in the prices of copper bars (best selected), sheet and rod, English pig lead and spelter. English block tin, £250 10s., £4 5s. increase.

Edward Till & Co. report, January 10th:—No change in the price of India-rubber, Para fine.

F. Smith & Co. report, January 10th:—No change in the prices of electrolytic copper bars, wire rods and h.c. wire, and silicium bronze wire.

### Low-voltage Advocated in France

In a recent issue of the *Revue Générale d'Electricité* M. L. Kervran, an inspector of the French Ministry of Labour, again puts forward a plea for the adoption of a lower pressure (65 V) for electrical installations in farmhouses, apartments, small works, &c., which he first suggested in 1936 with the object of reducing the risk of accidents and fires in connection with such installations. He adds that during the past three or four years the adoption of power supply at a voltage of 65 or less between paase and earth has made good progress, notable examples being the new installations in the Paris Opera House and at the Collège de France.

### Calendars, Diaries, &c.

The pocket diary received from the Key Engineering Co., Ltd., is bound in black Morocco leather, and in addition to a good deal of useful technical data has a number of sectional maps of the British Isles.

Aberdare Cables, Ltd., has sent us two packs of playing cards in an attractive box. The backs of the cards bear the initials and the name of the company.

The handy propelling pencil sent us by the British Vacuum Cleaner and Engineering Co., Ltd., has a device at the end which will appeal to pipe smokers. The metal back of this can be used for packing the bowl, while a rod attachment is useful for removing stoppages; it can also be used as a cigar piercer.

Elexcel, Ltd., has sent us a diary bound in navy-blue leatherette, with the company's trade mark in gilt on the cover. The diary contains 144 pages of technical information, and also a number of sheets of squared paper.

The calendar of Nalder Bros. & Thompson, Ltd., has monthly sheets showing the preceding and following months. Each sheet bears an illustration of one of the company's products.

The "Gatecrasher" is the title of a charming picture of a young shepherd and his pet lamb, which has been chosen by Brittain's Motors (formerly Langdon-Davies Electric Motor Co.) for their calendar, which has monthly slips.

The calendar of Peckett & Sons, Ltd., has monthly sheets, which also show the preceding and following months; these are surmounted by a picture of one of the company's locomotives.

An old-world picture of a pedlar in the stocks disposing of his wares, with the title "Business as usual," makes an effective illustration for the monthly calendar of Fitter & Poulton, Ltd.

Ransomes & Marles Bearing Co., Ltd., has sent us a useful calendar in tasteful shades of blue. In addition to monthly sheets, which show the preceding and following months, it has daily tear-off slips. Each of the monthly sheets illustrates some of the company's products.

A neat desk calendar with monthly cards has been received from the Barber Switchgear Co. The calendar for the whole of the year is given on the back.

### New Catalogues and Lists

**General Electric Co., Ltd.,** Magnet House, Kingsway, London, W.C.2.—A price variation list covering the company's products which came into force on January 1st.

**Synchromatic Time Recording Co., Ltd.,** 65, Erskine Street, Liverpool.—An illustrated folder giving particulars of "Synchromatic" electric clocks for office or factory use. Also a sheet detailing products of the company's A.R.P. department.

**Watson & Sons (Electro-Medical), Ltd.,** 76, Castle Street, Reading.—Leaflets relating to two recent products, the "Autonome II" motor driven couch and the "R.500" universal tilting couch.

**Brook Motors, Ltd.,** Empress Works, Huddersfield.—The latest issue of *The Brook*, containing an article on the use of the company's motors for air-conditioning plant.

**Metropolitan Electric Supplies,** 2, Marshalls Row, Brighton.—An illustrated folder showing "Metway" wooden lighting fittings.

**Burgess Products Co., Ltd.,** Brookfield Road, Hinckley, Leicestershire.—Literature describing the construction and also some of the many uses of the Burgess micro-switch.

**F. C. Heayberd & Co., Ltd.,** 10, Finsbury Street, London, E.C.2.—List 1032 giving details of the company's emergency lighting equipment for A.R.P. purposes.

**Northern Aluminium Co., Ltd.,** Bush House, Aldwych, London, W.C.2.—A sales engineering bulletin relating to gravity die castings in "NA.226" aluminium alloy.

## Information Department

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, &c., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

UNEK tailoring iron (elements).

# ELECTRICITY SUPPLY

## Reducing the "Peaks" at Eastbourne and Guildford. Difficult Position at St. Marylebone. Egyptian Power Scheme

**Birkenhead.**—Apparatus for Hire.—Application is being made by the Electricity Committee for permission to borrow £2,000 for the provision of apparatus on hire or hire purchase.

No Price Increase.—It has been decided to make no increase of charges at present.

Ripple Control System.—At a recent meeting of the Electricity Committee the engineer reported upon the advisability of installing a ripple control system, and was instructed to make further inquiries.

**Bognor Regis.**—Tariff Increase.—From the December meter readings the Bognor and District Gas and Electricity Co. is increasing the heating rate from 1d. to 1½d. per kWh. It does not propose to alter the existing rates for lighting (6d. per kWh) or power (1½d. per kWh), and the business and domestic tariffs are also unaltered, with the same fixed charges plus ¾d. per kWh.

**Bootle.**—Maintenance of Sodium Lamps.—The Watch Committee has authorised the borough engineer to put the sodium street lighting system into service for one hour a day in order to prevent deterioration.

**Bradford.**—Transforming Station.—An expenditure of £7,704 is involved in a proposal of the Electricity Committee to provide a district transforming station in connection with the supply to Clayton.

**Brigg.**—Ban Maintained.—Over a considerable period efforts have been made by the North Lincolnshire & Howdenshire Electricity Co. to persuade the Urban District Council to permit the installation of electricity in houses on the Council's estate without success. Recently the company again stated its case to a sub-committee of the Council, which decided against the company by a majority vote. The sub-committee suggested, however, that the matter should be reviewed at the end of the current financial year.

**Burnley.**—New Lighting Plans.—The Town Council on January 3rd approved a proposal to purchase 1,060 low-intensity street lighting units.

**Burton-on-Trent.**—Supply to Hoar Cross.—The Electricity Committee is to seek a Fringe Order to give a supply to Hoar Cross, for which purpose mains will be extended at a cost of £503.

**Carlisle.**—Power Station Extension Postponed.—It is reported that the C.E.B. has deferred the question of extending the Willow Holme power station.

**Chawleigh (Devon).**—Scheme Dropped.—The Exe Valley Electricity Co. has informed the Chawleigh Parish Council that in consequence of the war it will not be possible for the company to extend the supply to Chawleigh as had been arranged.

**Cheltenham.**—Circumstances of Supply Failure.—At last week's meeting of the Council Mr. W. J. Bache, the borough electrical engineer, made a statement regarding the recent supply failure, the longest in Cheltenham for nine or ten years. He said that a supply was obtained from the Shropshire Power Co. by two routes, via Tewkesbury and via Evesham. While the Tewkesbury line was undergoing routine inspection at 8.48 a.m. the Evesham line broke down. A partial supply was obtained from the Worcester Corporation's generating station at 9.50 a.m., and the company's own supply was fully restored at 10.35 a.m.

**Colne.**—Increased Charges.—The Town Council on January 4th decided to increase electricity charges by 10 per cent. forthwith. Mr. E. Duckworth said that since the war consumers had economised and this had seriously affected the undertaking's finances.

**Darlington.**—Prices Unaltered.—Having considered a report showing the estimated profit for the year ended March 31st next the Gas, Electricity and Transport Committee recommends that there should be no alteration in the existing charges for electricity.

**Eastbourne.**—Response to Appeal.—When the Council met on Monday the chairman of the Electricity Committee (Councillor Caffyn) announced that, following the appeal to consumers to avoid using electricity as much as possible during the peak hour each day during December, the peak load in that month was slightly less than two years ago, and much less than last year. Now that this object had been achieved, he hoped consumers would use as much electricity as they needed, for it was not rationed.

**East Coast.**—Public Utilities and the War.—At a meeting in London last week of the East Coast Distress Fund Committee, comprising delegates representing all East Coast resorts, and formed for the purpose of tackling the plight of these resorts occasioned by the war, it was urged by Mr. W. H. Easton, of Cromer, that losses on public utility undertakings should be included in their case. It was pointed out, however, that when a conference was appointed on the same lines during the last war, the Government had declined to consider losses on public utility undertakings. The conference therefore decided against their inclusion.

**Eccles.**—Loan for Domestic Appliances.—The Electricity Committee has obtained sanction to borrow £3,000 for domestic appliances.

**Fort William (Inverness).**—Power Plugs in Council Houses.—The Town Council is contemplating the installation of power plugs in houses, at an estimated cost of £1,047.

**Glasgow.**—Negotiations for Power Station Site.—The special sub-committee appointed to consider the acquisition of a suitable site for the erection of a new generating station reported to the Glasgow Corporation Electricity Committee recently regarding a meeting with the Law Committee of the Clyde Navigation Trust. Subsequently it was arranged that officials of the Trust and of the Department should consider the matter further.

New Transmission Lines.—It has become necessary to provide additional main transmission lines between Dalmarnock power station and various points in the system of supply, and to install additional switchgear and transformers. The Electricity Sub-Committee on Finance and Works which recently considered the matter agreed that the work should be proceeded with at an estimated cost of £97,430, and instructed the town clerk to make application for authority to borrow this amount.

Increased Assessment.—The general manager of the Electricity Department reports that the Assessor of Public Undertakings (Scotland) has fixed the net rateable valuation of the undertaking for 1940-41 at £143,528 as against £129,780 for the current year, an increase of £13,748.

**Guildford.**—Success of Peak Load Campaign.—It is reported in the *Surrey Times* that the appeal of the Electricity Committee to consumers to switch off electric fires between 11 a.m. and 1.30 p.m. each day during December and January has, up to the present, resulted in the difference between the midday peak and the next highest—at about breakfast time—being reduced from 2,000 kW to between 200 and 300 kW.

**Hastings.**—Overhead Line.—The Electricity Committee is to erect an additional overhead line to the Catsfield and Ninfield districts at a cost of £1,250.

**Hebden Royd.**—Supply to Sewage Works.—The Urban District Council proposes to provide a supply of electricity to the sewage disposal works.

**Ilkeston.**—Shelter Lighting.—The installation of electric lighting in public shelters has been authorised by the Emergency Committee.

**Liverpool.**—High-Voltage Cables.—The City Council has approved a proposal to lay new 33-kV cables at an estimated total cost of £119,195.

**London.**—St. Marylebone Price Increase.—How badly the St. Marylebone electricity undertaking has been hit by the war was made clear in a statement by Alderman G. B. Brooks, O.B.E., at a recent meeting of the Council. He gave the new estimate of consumption of the year as 165 million kWh, which falls short of the anticipated sales by 65 million kWh. Increases in charges were unavoidable, he said, and these were on the basis of 50 per cent. He added that it had always been their policy to pass on any profit to the consumer, and it was only fair that when there was a deficiency it should fall upon the consumer. This view was subscribed to by Councillor J. Bennett, who said that his home had been run on electricity and nothing else for fourteen years and he spoke as a satisfied consumer. Sir Duncan Watson stated that the Council's charges had been the lowest in the Metropolitan area.

Bethnal Green Charges.—Increases in electricity charges under every tariff have been authorised by the Borough Council. For lighting there will be an addition of 1d. per kWh and for heating ½d. per kWh; for industrial heating the charge will be raised from 0.5d. to 0.6d. per kWh.

Southwark.—The Electricity Committee does not propose to increase tariffs at the moment, but it is stated that prices may have to be raised later.

The Baths Committee is to repair and electrify the deep well pump at Manor Place bath at a cost of £250.

**Luton.**—Rural Development.—The increasing load on the transformers at the power station for the supply to rural areas will, the general manager considers, make necessary the installation of larger units by next winter. It is proposed to replace three 3,000-kVA transformers by three of 7,500 kVA, the estimated expenditure being £11,055. Also concerned with the rural system is a proposal to spend £1,851 on installing new transformers to improve the voltage at Markyate.

**Mansfield.**—INCREASED SALES.—Reporting on the progress of the electricity undertaking during November at a recent meeting of the Council the chairman of the Electricity Committee (Councillor J. H. Williamson) said that unlike the Gas Committee they were able to report an increased consumption.

**Motherwell.**—NEW SUB-STATION.—The Town Council at its last meeting approved a recommendation of the Electricity Committee for the erection of an additional sub-station at Berryhill, at an estimated cost of £2,320. Authority was given for the borrowing of this sum, plus an additional sum of £1,000 for the purchase of apparatus supplied to consumers under the hire-purchase scheme.

**Oban.**—BULK SUPPLY.—Negotiations, interrupted last October by the war, between the Town Council and the Grampian Supply Co. for a bulk supply of electricity may be resumed. The Council is faced with the alternative of spending about £40,000 on new plant at the municipal electricity works.

**Peterborough.**—ISSUE OF KETTLES STOPPED.—The electrical engineer and manager having reported that owing to Government requirements it was not possible to obtain supplies of aluminium electric kettles, the Council last week decided to discontinue issuing kettles with cookers for the duration of the war.

**Portsmouth.**—SUB-STATION SITES.—The Electricity Committee has obtained sites in Military Road, Gosport, and St. Thomas's Street, for sub-stations.

**Richmond (Surrey).**—TARIFF INCREASE.—An increase in charges is announced by the Richmond Electric Light & Power Co. The lighting flat rate is raised from 4¾d. to 6d. per kWh, heating from 1¼d. to 2d., and power from 2d. to 2½d.

**Salford.**—PURCHASES FROM SURPLUS REVENUE.—The Electricity Committee is seeking sanction to utilise surplus revenue for the purchase of meters (£3,297) and appliances (£18,838).

**Sleaford.**—ELECTRIC PUMPING PLANT.—The U.D.C. has asked the surveyor and electrical engineer to prepare a scheme for the electrification of the Greyless pumping station.

**South Shields.**—10 PER CENT. INCREASE IN CHARGES.—Last week the Council adopted a recommendation for a 10 per cent. increase in electricity charges. Councillor W. R. Blyton, chairman of the Electricity Committee, said that one of the reasons for this step was the five-year plan adopted by the Council and on which, up to the outbreak of war, approximately £100,000 had been spent.

**Torquay.**—EXTENSION SCHEME.—The Electricity Committee reports that the C.E.B. has postponed till the spring its decision regarding the proposed extension of the Newton Abbot power station. In this connection the Committee reports that Messrs. Kennedy & Donkin recommend a site for the extensions which will effect a saving of £35,800 on the first stage and a total saving of £65,800 if the station is enlarged to a capacity of 120,000 kW.

**Twickenham.**—STREET LIGHTING PAYMENTS.—It was recently reported to the Council that negotiations were in progress with the London and Home Counties J.E.A. regarding the street lighting agreement, in view of the cessation of lighting. It was felt that the reduction in the amount payable by the Corporation offered by the J.E.A. was insufficient, and efforts were being made to secure an arrangement more satisfactory to the Corporation.

**Wakefield.**—DIRECTION SIGNS.—The Lighting Committee is to provide 200 panel direction lamps at road junctions at an estimated cost of £1,570.

**Ware.**—HOUSE INSTALLATIONS.—The Rural District Council is inviting tenders for the installation of electricity in a number of Council houses.

**York.**—LOAN FOR CABLE-LAYING.—The Electricity Committee is seeking sanction to borrow £4,780 for laying an additional cable to the works of Rowntree & Co., Ltd.

## Overseas

**Canada.**—LARGE HYDRO-ELECTRIC SCHEME.—Such satisfactory progress is reported with the 162,000-HP hydro-electric development at present under way at La Tuque, Quebec, that it is now expected that this plant will be brought into commercial operation within eleven months, and possibly by the beginning of October next, when three units each of 40,500 HP will be in production. This will guarantee the Brown Corporation a ready and an immediate power supply for its pulp mills at La Tuque, which for some time have been running to full capacity. It will also put the Shawinigan Water & Power Co. in a position to meet the growing demands for additional power on its system, which serves the major part of the province of Quebec.

**Egypt.**—ESWAN DAM PROJECT.—According to the Cairo correspondent of *The Times* the Cabinet is understood to have decided to carry out the Aswan Dam power scheme drawn up two years ago, which was thought to have been permanently shelved on the outbreak of war. The scheme was previously estimated to cost £E7,000,000, but now, owing to increased prices, the outlay will be larger. The work will be carried out by British contractors. It is intended to manufacture artificial fertilisers and ammunition.

**India.**—PROGRESS IN MYSORE.—An increase from 238.6 million to 252.1 million kWh (6 per cent.) in the annual output of the State Electricity Department was reported by Sir Mirza M. Ismail, Dewan of Mysore, to the Representative Assembly recently. During the past year the Government had sanctioned the electrification of eleven new places, and proposals for the electrification of nine others were under consideration. The number of towns and villages electrified by the end of 1938-39 was 185.

**France.**—POWER PLANS.—The Minister of Public Works recently outlined plans for developing the country's power resources to the Senate Committee on Public Works. Observing that the war had brought with it a certain movement of the centres of electricity consumption through decentralisation of population and industry, the Minister pointed out that this was only a temporary situation, which should not be allowed to affect long-range plans. In spite of war, hydro-electric development was a necessity, otherwise France would find herself obliged to import large quantities of coal when peace came. The Ministry of Public Works was therefore considering the possibility of a revision of existing taxes on the electrical industry, in order to encourage the construction of plants at places where utilisation of the water power available was not at present an economic proposition. The Minister stated that France was well ahead of schedule in her electrification programme and there was no need for trepidation as to the future, but if the position was to be maintained the work must be carried on insofar as war conditions permitted.

# TRACTION

**Canada.**—TROLLEY-BUSES FOR EDMONTON.—Three trolley-buses have recently been delivered by Leyland Motors, Ltd., to the municipality of Edmonton (Canada), the bodies having been built by Park Royal Coachworks, Ltd., and the electrical equipment manufactured by the General Electric Co., Ltd. Each bus is equipped with a 135-HP compound wound "Witton" trolley-bus motor with the necessary contactor type control gear. Provision is made for controlled regenerative and rheostatic braking, operating in conjunction with the foot-brake pedal. The control gear is mounted at the back of the bus and is readily accessible through the rear panel. The buses are designed for operating speeds up to 43 MPH.

**Liverpool.**—TRAMWAY EXTENSION.—The Corporation Economy Committee has approved the extension of the tramway along the East Lancashire Road at an estimated cost of £95,000.

**Spain.**—TROLLEY-BUSES TO REPLACE TRAMWAYS.—According to *Metallurgia Electricidad* the city authorities of Bilbao, who were the first to introduce electric tramways in Spain, have recently decided to replace them by trolley-buses. A new undertaking to operate them is being jointly formed by the Bilbao City Council and the Compania de Tranvias.

**Switzerland.**—MOUNTAIN RAILWAY ELECTRIFICATION.—Since it was first put into operation in 1892 the rack railway between Glion and the Rochers de Naye, near Montreux, has, until recently, been worked by steam locomotives. The line, which is nearly five miles long and climbs about 4,200 ft., has now been electrified. The five electric coaches are mounted on two twin-axle bogies, each bogie being equipped with a DC series motor developing 77 kW at 2,080 RPM, which corresponds to a speed of the trains on the rack of 7.7 MPH. The power for the line is supplied from the 32-kV system of the Société des Entreprises Electriques Fribourgeoises, and is stepped down to 8,200 V at an automatic sub-station about 2½ miles from Glion, remotely controlled from the railway station at Caux. The plant at the sub-station comprises two 8,200/800-V transformers and two mercury rectifiers.

**Trinidad.**—TROLLEY-BUSES.—An order has been received by Ransomes, Sims & Jefferies, Ltd., for fourteen complete trolley-buses for Trinidad. The vehicles, which will have a seating capacity for thirty-one persons, will be equipped with 40-HP Ransomes standard lightweight traction motors, series wound for series field-regulated control.

# COMMUNICATIONS

**France.**—NEW CABLE-LAYING STEAMER.—The *Journal des Télécommunications* reports that the French Post and Telegraphs Department has put into service a new submarine cable-laying steamer. Known as the *Alsace*, the vessel has a tonnage of 1,500, and a length of about 288 ft.

**United States.**—DOORLESS TELEPHONE COMPARTMENTS.—Doorless telephone booths, acoustically treated to permit telephone users to talk and hear above the noise of subway trains, will be installed at the stations of the Sixth Avenue link of the Independent Subway System in New York City upon the completion of the stations next summer, states *Telegraph and Telephone Age*. The new type of booth is a development of the Bell Telephone Laboratories, in collaboration with the Engineering Department of the Board of Transportation of the City of New York. Fifty-six will be available to passengers at the five stations of the line along Sixth Avenue between West 53rd Street and Fourth Street, in Manhattan, when it is opened. The acoustical booth will be, in effect, a "sound trap," built in a niche slightly deeper than the tile-lined telephone booths in other subways of the city. On the Sixth Avenue line the upper half of the interiors of these niches will be lined with a sound-absorbent material, faced with perforated metal.

# NEW PATENTS

## Electrical Specifications Recently Published

*Compiled by a firm of chartered patent agents. The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.*

**1937**

31162. "Balancing of the resistances of mass-resistors." J. T. Shelvin (Siemens & Halske Akt. Ges.). May 27th, 1938. (Convention date not granted.) (515682.)

**1938**

7062. "Joints or terminating devices for coaxial conductor electric cables." Pirelli-General Cable Works, Ltd., and R. E. S. Soper. March 7th, 1938. (515683.)

7066. "High-frequency electrical conductors or radiators." A. D. Blumlein. March 7th, 1938. (515684.)

7154. "Indicating instruments for use on aeroplanes or the like." Sangamo Weston, Ltd., and G. F. Tagg. March 7th, 1938. (Cognate application 7095/39.) (515733.)

7551. "Electrically driven reeling or winding apparatus." March 10th, 1937. L. P. Krijger. (515685.)

11281. "Electrical oscillation generators." E. L. C. White. April 13th, 1938. (515786.)

13637. "Variable electrical inductances." B. N. Maclarty. May 6th, 1938. (515688.)

13848. "Electrical frequency-selective apparatus." J. Robinson. May 9th, 1938. (Addition to 509040.) (515739.)

14262. "Electric lamp fittings having diffuser globes." Veritys, Ltd., and J. W. Forth. May 13th, 1938. (515742.)

16188. "Electric switches controlling main and auxiliary circuits." J. A. Crabtree & Co., Ltd. (Schiele Industriewerke.) May 31st, 1938. (515834.)

16413. "Electric-discharge devices for illuminating purposes." Pearce Signs, Ltd., and J. H. G. Pearce. June 1st, 1938. (515691.)

16895. "Remote-control tuning arrangements particularly for high-frequency apparatus." Telefunken Ges. für Drahtlose Telegraphie. June 5th, 1937. (515693.)

16953. "Electrical fuses." C. Fieri. June 4th, 1937. (515747.)

17058. "Electrical signalling systems." Automatic Telephone & Electric Co., Ltd., and P. N. Roseby. June 8th, 1938. (515695.)

17142. "Selector for periodically sending signals along selected signalling circuits." Heathway Engineering Co., Ltd., and F. J. Mudge. June 9th, 1938. (515701.)

17177. "Protective casings, more particularly for electric cables." Metal Trim, Ltd., and E. Penkala. June 9th, 1938. (515703.)

17180. "Gas-filled electric incandescent lamps." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. June 12th, 1937. (515704.)

17198. "Arc-control devices for electric circuit-breakers." General Electric Co., Ltd., and C. J. O. Garrard. June 9th, 1938. (515706.)

17207. "Direct-current generators." B. N. Maclarty. June 9th, 1938. (515708.)

17229. "Aerial systems for wireless receivers." Telefunken-Ges. für Drahtlose Telegraphie. June 9th, 1937. (Addition to 501051.) (515710.)

17286. "Electrically controlled railway signalling apparatus." Siemens & General Electric Railway Signal Co., Ltd., and A. J. Golding and F. Horler. June 10th, 1938. (515793.)

17302. "Methods of protecting metallic electric conductors from chemical attack at high operating temperatures." British Thomson-Houston Co., Ltd., L. J. Davies and W. T. Cowhig. June 10th, 1938. (515718.)

17303. "Electric control systems." British Thomson-Houston Co., Ltd. June 10th, 1937. (515839.)

17337. "Toy electric vehicles." L. Marx & Co., Ltd. (Marx & Co., Inc.). June 10th, 1938. (Convention date not granted.) (515841.)

17362. "Starting devices for internal-combustion engines." R. Bosch Ges. June 11th, 1937. (515753.)

17416. "Apparatus for use in electric testing and measuring." C. G. Mayo and H. S. Walker. June 11th, 1938. (515761.)

17417. "High-frequency amplifier arrangements." Marconi's Wireless Telegraph Co., Ltd., and E. Green. June 11th, 1938. (515762.)

17426. "Signalling apparatus and the like." M.R.C., Ltd., and S. Pile. June 11th, 1938. (515887.)

17440. "Radio antennae." Marconi's Wireless Telegraph Co., Ltd. June 12th, 1937. (515795.)

17472. "Vibratory interrupter devices." P. R. Mallory & Co., Inc. June 11th, 1937. (515797.)

17507. "Electrical or electro-mechanical control systems of the error-correcting type." Baird Television, Ltd., and T. C. Nuttall. June 13th, 1938. (515843.)

17508. "High-frequency thermionic valve amplifiers." Baird Television, Ltd., and C. E. Maitland. June 13th, 1938. (515800.)

17509. "Television and like systems employing electronic scanning devices." Baird Television, Ltd., and V. A. Jones. June 13th, 1938. (515801.)

17527. "Electrical circuit-interrupters having arc-extinguishing arrangements." British Electrical & Allied Industries Research Association, L. Gosland and W. B. Whitney. June 13th, 1938. (Cognate application 5005/39.) (515888.)

17550. "Electrical follow-up devices for the automatic control of aircraft." Siemens Apparate und Maschinen Ges. June 12th, 1937. (515802.)

17566. "Electrical signalling systems." Automatic Telephone & Electric Co., Ltd., and W. Saville. June 13th, 1938. (Cognate application 29123/38.) (515805.)

17605/17606. "Electrically insulating bodies." A. Reyrolle & Co., Ltd., A. Kirkwood, I. W. A. Wood and P. D. Ritchie. June 14th, 1938. (515890/515891.)

17631. "Automobile radio antenna." Transitone Automobile Radio Corpn. June 17th, 1937. (515892.)

17639/17640. "Dry shavers." American Safety Razor Corpn. June 22nd, 1937. (515850/515765.)

17658. "Thermally operated electric switches." A. R. J. Ramsey (Automatic Control Corpn.). June 14th, 1938. (515851.)

17665. "Lighting equipment such as fittings, luminaires and the like." K. Norden. June 14th, 1938. (Convention date not granted. (515893.)

17669. "Dipole aerials." Kolster-Brandes, Ltd., and P. L. Chatterjee. June 14th, 1938. (515853.)

17675. "Electron discharge devices." Standard Telephones and Cables, Ltd., D. H. Black and R. R. Back. June 14th, 1938. (Addition to 494100.) (515854.)

17712. "Electric condensers." Siemens and Halske Akt. Ges. June 14th, 1937. (515858.)

17714. "Electro-acoustic apparatus." J. T. Shelvin (Siemens and Halske Akt. Ges). June 14th, 1938. (515859.)

17727. "Radio receiver antenna lead-in coupling arrangements." F. J. Chart. June 15th, 1937. (515898.)

17729. "Electrical timing circuits." Automatic Telephone and Electric Co., Ltd., T. P. Priest and G. W. Thompson. June 14th, 1938. (515860.)

17822. "Electric oscillation generators for producing oscillations of saw-tooth wave-form." Telefunken Ges. für Drahtlose Telegraphie. June 15th, 1937. (515903.)

17847. "Counterbalancing means for X-ray apparatus." E. Phol. June 15th, 1938. (515909.)

19012. "Turbo-electrically driven vehicles." British Thomson-Houston Co., Ltd. June 25th, 1937. (515726.)

19190. "Fusible elements for the protection of electric circuits." Callender's Cable and Construction Co., Ltd., and A. W. Metcalf. June 28th, 1938. (515729.)

19442. "Thermionic valve circuits." E. L. C. White. June 30th, 1938. (515864.)

19456. "Device for testing the lamps used on motor vehicles and for accurately determining the position thereof." June 30th, 1938. (515773.)

19591. "Obtaining of high-voltage impulses, more particularly for internal-combustion engine ignition systems." British Thomson-Houston Co., Ltd., and H. de B. Knight. July 1st, 1938. (515812.)

19725. "Arrangement for measuring the intensity of short-wave radiations such as X-rays, gamma rays, and the like, with a Geiger-Muller counter with vapour addition, especially for the purpose of testing materials without destroying them." Ges. für Forderung Zerstorungsfreier Prufverfahren e.V. November 20th, 1937. (515869.)

19844. "Electrically driven shearing-heads for shearing or clipping horses, sheep and other animals." Wolseley Sheep Shearing Machine Co., Ltd., and W. E. Beswick. July 5th, 1938. (515916.)

19914. "Thermionic valves." M-O Valve Co., Ltd., E. C. Cherry and G. W. Edwards. July 5th, 1938. (515872.)

19950. "Magnetic cores for electrical measuring instruments." English Electric Co., Ltd., and G. Tilstone. July 6th, 1938. (515873.)

20107. "Synchronous electric motors." Chamberlain and Hookham, Ltd., S. James, and R. P. Bossom. July 7th, 1938. (515924.)

20134. "Holders or sockets for thermionic valves or the like." Carr Fastener Co., Ltd., and G. Wagstaff. July 7th, 1938. (515927.)

23060. "Electrodes for electrolytic devices and methods of making the same." J. B. Brennan. August 9th, 1937. (515880.)

35123. "Modulation systems for high-frequency oscillations." Intercontinental Service Corporation. December 2nd, 1937. (515824.)

**1939**

7035. "Electric starter systems for internal-combustion engines." March 3rd, 1939. F. L. Witcomb. (515731.)

20437. "Echo-sounding recorders." Marconi's Wireless Telegraph Co., Ltd., and N. P. Hinton. March 19th, 1938. (Divided out of 515202.) (515826.)

22187. "Electric switching devices for the control of moulding-presses." Moulded Insulation Co. June 5th, 1937. (Divided out of 515790.) (515828.)

# TRADE MARK APPLICATIONS

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from January 3rd :—

Wing. No. 609633. Class 9 (IV). Dry batteries. — Joseph Esterman and Barnet Gellman, trading as Esterman & Gellman, 59-61, Hatton Garden, London, E.C.1.

C and Double Cross (letter and design). No. 605964. Class 11 (IV). Parts of installations for lighting, heating, steam generating, cooking, refrigerating, drying, ventilating, water supply and sanitary purposes, all such goods being made of carbon or carbon composition, carbons and carbon rods for electrical purposes. Société Le Carbone-Lorraine, Gennevilliers, Seine, France. (British representatives, D. Young & Co., 11-12, Southampton Buildings, Chancery Lane, London, W.C.2.

# FINANCIAL SECTION

**New Companies. Returns of Capital. Debenture Charges. Bankruptcies and Liquidations. Reports of Electrical Companies. Dividend Announcements. Stocks and Shares**

## New Companies Registered

**Metallo Engineering Co., Ltd.**—Private company. Registered January 2nd. Capital, £500. Objects: To carry on the business of manufacturers, importers, exporters, wholesalers and retailers of and agents for electrical, wireless and television apparatus, electrical goods, dry batteries, stoves, &c. Subscribers: J. P. Newey, 47, Dalberg Road, S.W.2; and P. Wand, 10, Cliff Avenue, Leigh-on-Sea. Secretary: J. P. Newey. Registered office: 105, Cheapside, E.C.2.

**Trafford Battery Co., Ltd.**—Private company. Registered January 3rd. Capital, £500. Objects: To carry on the business of dealers in and manufacturers of batteries, accumulators or other electrical apparatus, &c. Subscribers: A. M. Turner and Mrs. M. M. Turner, both of 40, Riverton Road, East Didsbury. Secretary: M. M. Turner. Registered office: York Chambers, 27, Brazennose Street, Manchester.

**Opco Radio & Television Corporation, Ltd.**—Private company. Registered January 3rd. Capital, £3,000. Objects: To acquire letters patent, brevets d'invention, rights and privileges, and to carry on the business of manufacturers and suppliers of and dealers in apparatus, instruments, devices, machinery, appliances and accessories connected with the generation, transmission and reception of signals by radio and other means; radio, electrical and mechanical engineers, &c. Subscribers: E. L. Dumpier, 13, Grafton Square, Clapham, S.W.4; and E. Hayes, 15, Searls Road, New Kent Road, S.E.1. Solicitors: Ashby Rogers and Fournier, 12/13, Henrietta Street, W.C.2.

**Mulparvo, Ltd.**—Private company. Registered January 3rd. Capital, £2,050. Objects: To carry on the business of manufacturers of and dealers in radio receivers, appliances, apparatus and accessories, telephones and electrical and mechanical appliances and accessories, sound production apparatus, including hearing aids, cameras and photographic appliances, cinematograph cameras and projectors, &c. Directors: W. H. Godfrey, 28, Vicarage Road, Hampton Wick, Middlesex; F. E. Rosher, 38, Sispara Gardens, West Hill, Putney, S.W.18; L. Smith, Tudor House, Hall Lane, Walton-on-Naze; and H. W. Sydenham, 31, Wildwood Road, Hampstead, N.W. Registered office: 17, Gillingham Street, S.W.1.

**Thecla Engineering Co., Ltd.**—Private company. Registered January 6th. Capital, £7,000. Objects: To carry on the business of mechanical, electrical, motor, and general engineers, engineering and general contractors and agents, manufacturers of, agents for and dealers in engineering specialities, &c. A. C. Lynch, 43, Cleveland Avenue, Darlington, is permanent governing director and chairman.

**Laurance Smith, Ltd.**—Private company. Registered January 5th. Capital, £250. Objects: To carry on the business of manufacturers and repairers of and dealers in electrical accumulators, batteries, acids and containers, dynamos, motors, transformers, magnetos and electrical plant, manufacturers of and dealers in wireless transmitting and receiving sets, &c. Directors: L. L. Smith and Mrs. R. Harris, both of 11, Alvanley Court, Finchley Road, N.W.3.

**Wireless Supply Depot (Malvern), Ltd.** — Private company. Registered January 3rd. Capital, £1,000. Objects: To acquire the business of a wireless engineer carried on by L. H. Mansell at Holyrood Terrace, Malvern, Worcs, as the Wireless Supply Depot. L. H. Mansell, "Woodfield," Madresfield Road, Malvern, is permanent director and chairman.

**Barnwell & Fallon, Ltd.**—Private company. Registered January 4th. Capital, £2,000. Objects: To acquire the business of electrical engineers, radio dealers, &c., now carried on by A. E. Barnwell and J. F. Fallon, at 28, Station Parade, Harrogate, as Barnwell & Fallon. Permanent managing directors: A. E. Barnwell, 21, Haywra Street, Harrogate, and J. F. Fallon, 15, Bilton Grove Avenue, Harrogate. Registered office: 28, Station Parade, Harrogate.

**Quick Supply, Ltd.**—Private company. Registered January 4th. Capital, £100. Objects: To carry on the business of manufacturers, importers and exporters of, agents for and wholesale and retail dealers in general engineering, plant, repetition work, mechanical and chemical articles, electrical, radio and television fittings and apparatus, &c. Directors: M. Rabinowicz (permanent), 16, Yew Tree Road, Edgbaston, Birmingham, and M. Spingler, 97, Cazenove Road, N.16. Registered office: Yew Tree Road, Edgbaston, Birmingham.

**E. Wight & Co., Ltd.**—Private company. Registered January 4th. Capital, £10,000. Objects: To acquire the goodwill, plant, &c., connected with the business of E. Wight & Co., carried on by W. F. W. Richardson and H. A. H. Southey, at 373, Regents Park Road, Finchley, and Hill Top, Muswell Hill, N., and to carry on the business of manufacturers and repairers of and dealers in electrical accumulators, batteries, acids and containers, &c. Permanent directors: W. F. W. Richardson, 52, Dollis Road, Finchley, N.3, and H. A. H. Southey, 10, Gresham Avenue, N.20. Solicitor: J. Hugh Jones, 162, Ballards Lane, Church End, Finchley, N.3.

## Companies' Returns

### Statements of Capital

**Electric Reduction Co., Ltd.**—Capital, £50,000 in 16,200 preference and 33,800 ordinary shares of £1. Return dated October 10th, 1939. 16,200 preference and 28,800 ordinary shares taken up. £18,000 paid on 13,000 preference and 5,000 ordinary shares. £27,000 considered as paid on 3,200 preference and 23,800 ordinary shares. Mortgages and charges, £25,000.

**R. & W. (Electrical), Ltd.**—Capital, £2,550 in 1,000 ordinary shares of 1s. and 2,500 6 per cent. participating preference shares of £1. Return dated October 12th, 1939. 1,000 ordinary and 1,500 preference shares taken up. £1,550 paid. Mortgages and charges, £750 debentures.

**George H. Scholes & Co., Ltd.**—Capital, £8,000 in 5,000 preference and 3,000 ordinary shares of £1. Return dated November 6th, 1939. 4,482 preference and 3,000 ordinary shares taken up. £5,096 paid on 4,096 preference and 1,000 ordinary shares. £2,386 considered as paid on 386 preference and 2,000 ordinary shares. Mortgages and charges, nil.

**Seabrook Batteries, Ltd.**—Capital, £100 in £1 shares. Return dated September 1st, 1939. All shares taken up. £100 paid. Mortgages and charges, nil.

**Mersey Cable Works, Ltd.**—Capital, £70,000 in £1 shares. Return dated November 10th, 1939. All shares taken up. £62,400 paid. £7,600 considered as paid. Mortgages and charges, nil.

**Walsall Electrical Co., Ltd.**—Capital, £3,500 in 1,500 preference and 2,000 ordinary shares of £1. Return dated October 16th, 1939. 1,170 preference and 1,840 ordinary shares taken up. £3,010 paid. Mortgages and charges, nil. A return of allotments, made up to October 17th, 1939, shows a further 200 preference shares allotted for cash and fully called up.

**Credenda Conduits Co., Ltd.**—Capital, £50,500 in £1 shares. Return dated November 2nd, 1939. All shares taken up. £30,500 paid. £20,000 considered as paid. Mortgages and charges, nil.

**Simplex Conduits, Ltd.** — Capital, £100,000 in £1 shares. Return dated November 2nd, 1939. 90,000 shares taken up. £50,000 paid. £40,000 considered as paid. Mortgages and charges, nil.

**Hellesens, Ltd.**—Capital, £160,000 in 112,000 "A" and 48,000 "B" shares of £1. Return dated August 18th (filed September 23rd), 1939. All shares taken up. £160,000 paid. Mortgages and charges, nil.

**Electrical Power Fitting Co., Ltd.**—Capital, £500 in £1 shares. Return dated October 7th, 1939. 305 shares taken up. £218 3s. 10d. paid, leaving £86 16s. 2d. calls in arrears. Mortgages and charges, nil.

### Mortgages and Charges

**Hugh Campbell (London), Ltd.**—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated December 18th, 1939, to secure £1,000. Holder: Alfred Collis, 55, FitzJames Avenue, W. Kensington.

**Dicona, Ltd.**—Debenture, dated December 1st, 1939, to secure £1,000 and any further advances not exceeding in the aggregate £4,000, charged on the company's undertaking and property, present and future, including uncalled and unpaid capital (subject to debenture dated March 17th, 1936). Holder: E. J. Knight, 4, Vernon Street, Derby.

### Receivers Appointed and Released

**Gilbert's Electrical, Ltd.**—K. M. Scott, of 11, Old Jewry, E.C., was appointed receiver on December 28th, 1939, under powers contained in debenture dated April 1st, 1938.

**D.C. Electrical Co., Ltd.**—Francis V. L. Redman, of 1, Tudor Buildings, Swanage, Dorset, ceased to act as receiver on December 15th, 1939.

### Company Liquidations

**G. Lawrance & Co., Ltd.,** Fore Street, Redruth, radio and electrical dealers.—The statutory meeting of creditors was held recently at Truro, when it was decided that the voluntary liquidation of the company should be continued with Mr. H. E. Boaden, of 21, King Street, Truro, as liquidator. The statement of affairs showed ranking liabilities of £3,337. The assets were estimated to realise £1,551, and they were subject to preferential claims of £77, leaving a balance of £1,474 to meet a claim under a debenture of £1,812. There was a deficiency so far as the debenture holder was concerned of £337, and there were no assets available for the unsecured creditors.

**McHales Radio, Ltd.,** radio dealers, 102/3/4, New Road, Great Bridge, and 69, Waterloo Road, Smethwick.—A meeting of the creditors was held recently when the statement of affairs showed liabilities of £1,875 and net assets of £1,072, leaving a deficiency, as regarded the creditors, of £803. It was decided that the voluntary liquidation of the company should be continued with Mr. F. E. Bendall, of Poppleton & Appleby, King Edward House, New Street, Birmingham, as liquidator.

Meetings will be held on February 7th at 11, Waterloo Street, Birmingham, at which Mr. G. O. H. Smith, the liquidator, will submit an account of the winding-up of the following companies:—Ledbury Electric Supply Co., Ltd.; Ludlow Electric Light Co., Ltd.; Stratford-on-Avon Electricity Co., Ltd.; Tewkesbury Electric Co., Ltd.; Kidderminster and District Electric Supply Co., Ltd.; Banbury and District Electric Supply Co., Ltd.

**Hubbard & Williams, Ltd.**—Winding-up voluntarily. Liquidator, Mr. H. Stanley-Longworth, 3a, Albion Street, Manchester.

### Bankruptcy Proceedings

**A. J. Davis,** 15, Bridge Street, Exeter, wireless dealer and electrician.—The first meeting of creditors was held on January 5th at the Official Receiver's office, Exeter Bank Chambers, Broadgate, Exeter, when the statement of affairs disclosed gross liabilities of £1,601, of which £653 was expected to rank for dividend.

(*Continued on page* 57).

# STOCKS AND SHARES

TUESDAY EVENING.

THE outstanding feature of the Stock Exchange markets is the manner in which British Government stocks have gone ahead under the influence of very substantial buying. For stock like War Loan, of which there is £1,911 million in issue, to rise more than a point in a day, as it did on Monday, is a surprising event in Stock Exchange markets during wartime. Other British Government issues have advanced sympathetically. A slight check to the boomlet was noticeable on Tuesday in this week.

With the strength of the Consol market, other gilt-edged stocks are sympathising. The effect is likely to become more widely spread as the volume of floating supply in the Consol market diminishes. It is possible that the recent falls in such shares as those of the best class in the electricity supply section will be recovered under the continued pressure of investment demand.

Business throughout the House as a whole shows a further tendency to expand. The number of bargains daily recorded is on the increase. Money released from end December deposit accounts is flowing freely into the House, more especially, as already mentioned, into the British Government and other safety-first securities.

## Gilt-edged Boomlet

In the first ten days of 1940, the prices of several British Government issues rose higher than at any time in 1939. Not every issue had that distinction, War Loan, the leader, being quoted at 96½ (after reaching 97) against last year's highest point of 98¾. Nevertheless, the strength of the market is witness, in impressive fashion, to the confidence felt in the ability of the Treasury to back the national war effort with cheap and abundant money. A rising market generally attracts the public, more particularly the speculatively-minded section. Although, therefore, the bulk of the present heavy buying of gilt-edged stocks is reported to be on genuine investment account, it is probable that some of it is not blameless of speculative intent. Shortage of stock is acute. The determined manner in which the buyers absorb such stock as becomes tempted out by successive rises in quotations, suggests that the movement still has steam behind it.

London Electric Transport 2¼ per cent. are 2½ higher at 89. Smaller gains have accrued to Central Electricity and London Passenger Transport stocks.

## Dividends in 1940

With many companies making up their annual accounts to the end of December, the first months of a new year yield the biggest crop of dividends. Accountants are at work on hundreds of sets of books. Circumstances suggest that on this occasion, shareholders will await the striking of the balances, and their dividend awards, with more than the average amount of interest, though with less guidance than usual in framing their estimates. Trading profits will reflect the results of a period including eight months of uneasy peace, with disturbance to ordinary business but with a growing amount of armament activity, and four months of war, which have greatly exaggerated that condition and added new liabilities to taxation.

The outcome in terms of profits is, in itself, sufficiently difficult to foresee. In the distribution of these profits, moreover, unknown quantities are present in the individual views of boards of directors as to their companies' tax liabilities, to the need for conservation of money in their businesses, to provision for contingencies, and so on. Judging by the present tone of the markets, it can be said, as a generalisation, that dividend prospects in this new year are assessed with hopeful confidence.

## Electricity Supply Companies

March is the month which sees the majority of final dividend decisions by the home electricity undertakings. Two of the most interesting—those by the County of London and Metropolitan companies—fall due in that month. Others in March include those of the Midland Counties, Midland Electric Corporation, North-Eastern Electric, South London, Scottish Power and Clyde Valley. London Associated Electric final payment is due in February; some reduction is discounted in the present price of the shares. Another final dividend due before March is that on Yorkshire Electrics. In April, dividends are due from British Power & Light and Lancashire Electric. Edmundsons Corporation makes up the year to the end of March, and pays a final dividend in June.

## Electrical Equipment Distributions

English Electric's final dividend is generally among the earliest events in the electrical equipment market's year. British Insulated and Telegraph Construction final distributions are due in March. April sees a number of important decisions, including those of Associated Electrical (a single payment for the full year), Automatic Telephone, Ericsson Telephone, Henley's and Reyrolles, with an interim from J. Lucas. In May, interest will be centred particularly on the Johnson & Phillips and Ever Ready payments. Siemens, Electric Construction and Telephone Manufacturing pay dividends at about the same time. In June, come final decisions by Callender's and Chloride Electrical Storage. A little later, General Electric's single annual payment falls due. Crompton Parkinson pay their final in the last month of the year.

## Revival in "Emmies"

The 10s. shares of Electrical and Musical Industries are quoted up to their par value again, after having languished for some time between 7s. and 8s. Last week's recovery of 2s. in as few days suggested that the shares retain a popular following, although supporters have been discouraged in recent times by the depression of the radio trade, the deficit in the company's last accounts and the absence of a dividend in 1939. No particular reason has shown itself in explanation of the suddenness of the revival. In point of fact, it seems that the movement was touched off by a persistent buyer of the preference shares up to about 20s. Prospects for the ordinary shares are held to be improved by reports that the ordinary business is above expectations, and by hopes that the additional work which the company is known to have on hand will provide a modest dividend. Having made good profits in the years which serve as the standard for Excess Profits Tax purposes, the company is considered to be satisfactorily placed in that respect.

## Engineering Shares

A generally firm background in the industrial markets is enlivened every now and then by a flash of activity in one section or another. For a week or two, textile shares have been very much the public fancy, prices going ahead by leaps and bounds. Last week, the engineering and steel section took a turn in the limelight. With no especial prompting, attention appeared to become aware of attractive and reasonably assured yields in prospect from the shares in this group. As so often happens, it seems that a moderate amount of bidding for shares in scarce supply began to put up prices. Signs of stirring life drew the notice of people on the look-out for scope for enterprise. Representative results are the improvements of a florin in Vickers, to 18s. 6d., and of half-a-crown in Babcock & Wilcox to 43s. 9d. Murex, at 82s. 6d., Tube Investments, at 89s. 6d., and Lancashire Dynamo, at 56s. 3d., are also higher.

In the same group, attention is being directed towards the £1 shares of Hopkinsons, the manufacturers of boiler mountings, etc. At 42s. 6d., the shares show a return of 7 per cent. on last year's 15 per cent. distribution, without any inference being drawn from the increase in the current year's interim payment from 2½ to 5 per cent. Westinghouse Brakes have dropped half-a-crown, to 42s. 6d., in reflection of some uneasiness over the dividend due next month. There has been a sympathetic fall from 65s. to 60s. in Consolidated Signals, the company's chief interest being the Westinghouse Brake concern.

## Price Changes

The few alterations marked this week among electricity supply shares suggest no decided trend of prices. A fall of 1s. 3d. to 35s. in County of Londons is balanced by an improvement of like amount in London Electrics at 26s. 3d. Bournemouth and Pooles are dull at 57s. 6d., and there are small declines in Edmundsons, and Midland Counties. Llanelly Electrics have hardened to 19s. 6d. The overseas group has a cheerful appearance, with the Indian companies' shares again showing firmness, Cawnpores being the feature with a rise of 1s. 3d. to 28s. 9d. In other areas, improvements are marked in Tokyo Electrics 6 per cent. bonds, at 63¾, on rising hopes of an end to the Sino-Japanese conflict, in Kalgoorlie Electrics at 10s. 6d., and in the stocks of the leading Canadian utility companies. In the electrical equipment market, English Electrics are—exceptionally—on the dull side at 30s.

## Miscellaneous Matters

Rheostatic 4s. shares have changed hands at around 6s. 3d. since the declaration of a final dividend making 16 per cent. for the year, or 8 per cent. more than for 1938. The yield works out at over 10 per cent. Thermostats are the firm's chief product. Cable and Wireless preference stock has gained 3 points this week to 95½, while the ordinary has marked time at 56½. Telephone Rentals are a good spot at 8s. 3d., ex-dividend. An interesting feature in the traction group is the strength of British Electric Traction preferred at 155. The quotation has risen ten points on the week, and 13 in a fortnight. An accompanying drop of 25 points to 675 in the price of the deferred stock suggests that "switching" has been in progress.

As the weeks pass with no pronouncement on the terms of Government compensation for the wartime control of the railways, an interesting situation is arising out of the approach of the time for dividend declarations by the main-line companies: the market remains cheerful, if somewhat irregular. North Metropolitan Power Station 3½ per cent. new debentures can hardly be bought under the original price of the issue, namely 91½. The yield is £3 16s. 6d. per cent., or £4 1s. per cent., allowing for redemption in 1965. No stamp duty is payable at present upon transfers. Six months' interest, 35s. per cent., is due on March 1st.

# ELECTRICAL COMPANIES' SHARES

## Prices, Dividends and Yields

| Company | 1939 Highest | 1939 Lowest | Dividend Previous | Dividend Last | Price Jan. 9 | Rise or Fall | Yield p.c. £ s. d. |
|---|---|---|---|---|---|---|---|
| **Home Electricity Companies** | | | | | | | |
| Bournemouth and Poole | 68/3 | 56/– | 15 | 15 | 57/6 | −½ | 5 4 4 |
| British Power and Light | 30/9 | 21/– | 7 | 7 | 26/– | — | 5 7 8 |
| City of London | *33/9 | 22/– | 7½ | 7½ | 26/6 | — | 5 13 2 |
| Clyde Valley | 38/6 | 26/9 | 8 | 8 | 33/3 | — | 4 16 3 |
| County of London | 46/9 | 28/– | 10½ | 10½ | 35/– | −½ | 6 0 0 |
| Edmundson's: | | | | | | | |
| 7% Pref. | 31/6 | 27/6 | 7 | 7 | 27/6 | — | 5 1 10 |
| Ord. | 27/9 | 18/– | 9 | 6 | 22/6 | −6d. | 5 6 8 |
| Elec. Dis. Yorkshire | 41/6 | 32/– | 9 | 9 | 35/9 | — | 5 0 5 |
| Elec. Fin. and Securities | 48/3 | 39/– | 12½ | 12½ | 40/– | — | 6 5 0 |
| Elec. Supply Corporation | 51/9 | 40/– | 12 | 12 | 41/3 | — | 5 16 0 |
| Isle of Thanet | 20/– | 15/– | 4 | 4 | 15/– | — | 5 6 8 |
| Lancs Light and Power | 34/6 | 25/– | 7½ | 7½ | 28/9 | — | 5 4 4 |
| Llanelly Elec. | 22/6 | 16/6 | 5½ | 5½ | 19/6 | +6d. | 5 12 9 |
| Lond. Assoc. Electric | 30/– | 18/– | 7 | 7 | 19/6 | — | 7 3 7 |
| London Electric | 34/3 | 20/– | 7 | 7 | 26/3 | +⅛ | 5 6 8 |
| London Power Deb. Red. | 106½ | 97 | 5 | 5 | 103½ | — | 4 16 6 |
| Metropolitan | 51/– | 32/6 | 12 | 12 | 37/– | — | 6 9 9 |
| Midland Counties | 39/6 | 30/– | 8 | 8 | 33/9 | −9d. | 4 14 9 |
| Mid. Elec. Power | 41/9 | 33/6 | 8 | 9 | 36/3 | — | 4 19 4 |
| Newcastle Elec. | 28/9 | 25/– | 7 | 7 | 26/3 | — | 5 6 8 |
| North Eastern Electric: | | | | | | | |
| Ordinary | 32/3 | 23/6 | 7 | 7 | 27/– | – | 5 3 8 |
| 7% Pref. | 32/6 | 26/– | 7 | 7 | 30/– | — | 4 13 4 |
| Northampton | 48/– | 41/– | 10 | 10 | 42/6 | — | 4 15 0 |
| Notting Hill 6% Pref. (£10) | 13¼ | 10½ | 6 | 6 | 9½ | — | — |
| Northmet Power: | | | | | | | |
| Ordinary | 46/6 | 30/6 | 10 | 10 | 36/3 | — | 5 10 1 |
| 6% Pref. | 29/– | 23/6 | 6 | 6 | 27/– | — | 4 9 0 |
| Richmond Elec. | 29/– | 21/6 | 7 | 7 | 23/9 | — | 5 18 0 |
| Scottish Power | 38/9 | 27/6 | 8 | 8 | 32/6 | — | 4 18 6 |
| Southern Areas | 22/9 | 17/– | 5 | 5 | 18/– | — | 5 11 1 |
| South London | 30/9 | 22/– | 7 | 7 | 22/– | — | 6 7 3 |
| West Devon | 23/3 | 18/– | 5 | 5 | 18/9 | — | 5 6 8 |
| West Glos | 21/3 | 15/– | 2 | 2½ | 16/3 | — | 3 1 6 |
| Yorkshire Elec. | 38/6 | 27/9 | 8 | 8 | 33/9 | — | 4 14 10 |
| **Overseas Electricity Companies** | | | | | | | |
| Atlas Elec. | 4/3 | 1/6 | Nil | Nil | 2/9 | — | — |
| Calcutta Elec. | 39/– | 25/– | 10* | 10* | 31/– | — | — |
| Cawnpore Elec. | 34/6 | 27/3 | 10 | 10 | 28/9 | +⅛ | — |
| East African Power | 26/3 | 20/– | 7 | 7 | 23/6 | — | 5 19 2 |
| Jerusalem Elec. | 24/6 | 21/– | 7 | 7 | 21/6 | — | 6 10 4 |
| Kalgoorlie (10/–) | 10/6 | 9/– | 7½ | 7 | 10/6 | +6d. | 6 13 4 |
| Madras | 31/– | 21/3 | 8* | 8* | 22/– | — | — |
| Montreal Power | 35½ | 30 | 1½ | 1½ | 34½ | +1 | — |
| Palestine Elec. "A" | 27/3 | 19/6 | 7½* | 5* | 22/6 | −⅛ | 4 9 0 |
| Perak Hydro-electric | 19/6 | 12/6 | 6 | 2½ | 19/6 | — | 2 11 4 |
| Shawinigan Power | 25 | 20 | 85cts. | 83cts. | 26½ | +½ | — |
| Tokyo Elec. 6% | 63 | 33 | 6 | 6 | 63½ | +6 | 9 9 0 |
| Victoria Falls Power | 73/9 | 60/– | 12½ | 15 | 68/9 | — | 4 7 3 |
| Whitehall Investments Pref. | 19/6 | 10/– | 7½ | 7½ | 14/– | — | 10 14 2 |
| **Public Boards** | | | | | | | |
| Central Electricity: | | | | | | | |
| 1950–70 | 112 | 103 | 5 | 5 | 107½ | +1 | 4 13 0 |
| 1955–75 | 115½ | 104½ | 5 | 5 | 108 | — | 4 12 6 |
| 1951–73 | 106½ | 101 | 4 | 4½ | 103 | — | 4 7 3 |
| 1963–93 | 95½ | 84 | 3½ | 3½ | 91 | — | 3 18 7 |
| London Elec. Trans. Gtd. | 88½ | 83 | 2½ | 2½ | 89 | +2½ | 2 16 2 |
| London & Home Counties | | | | | | | |
| 1955–75 | 107½ | 105 | 4½ | 4½ | 106½ | — | 4 4 6 |
| Lond. Passenger Transport: | | | | | | | |
| A | 114½ | 103 | 4½ | 4½ | 105½ | +1 | 4 5 2 |
| B | 117½ | 102 | 5 | 5 | 104½ | +2 | 4 15 7 |
| C | 83½ | 64½ | 4 | 1½ | 65 | — | 2 6 2 |
| West Midland Joint Elec., | | | | | | | |
| 1948–68 | 112½ | 104½ | 5 | 5 | 106 | — | 4 14 4 |
| **Telegraph and Telephone** | | | | | | | |
| American Tel. & Tel. | 210 | 159 | 9 | 9 | 207½ | +2 | 4 7 8 |
| Anglo-Am. Tel.: | | | | | | | |
| Pref. | 101½ | 82 | 6 | 6 | 94½ | — | 6 7 0 |
| Def. | 23⅜ | 17 | 1½ | 1½ | 21½ | — | 6 19 6 |
| Anglo-Portuguese | 24/– | 16/6 | 8 | 8 | 20/– | — | 8 0 0 |
| Cable & Wireless: | | | | | | | |
| 5½% Pref | 97 | 75 | 4½ | 5½ | 95½ | +3 | 5 15 2 |
| Ord. | 57½ | 35 | 4 | 4 | 56½ | — | 7 1 8 |
| Income | 100 | 85½ | — | — | 93½ | — | 4 5 7 |
| Canadian Marconi $1 | 6/– | 3/9 | — | Nil | 5/– | — | — |
| Globe Tel. & Tel.: | | | | | | | |
| Ord. | 32/3 | 22/6 | 7½* | 7½* | 27/6 | — | 5 9 1 |
| Pref. | 26/9 | 20/– | 6 | 6 | 25/– | — | 4 16 0 |
| Great Northern Tel. (£10) | 38 | 18 | 20 | 20 | 20½ | — | 9 15 2 |
| Inter. Tel. & Tel. | 10½ | 5 | Nil | Nil | 5½ | +½ | — |
| Marconi-Marine | 30/– | 23/– | 7½ | 10 | 27/6 | — | 7 5 1 |
| Oriental Telephone Ord. | 2½ | 42/6 | 12* | 12* | 2⅛ | — | 5 4 0 |
| Radio Corpn. | 8⅞ | 5⅜ | 8 | 6 | 7½ | — | — |
| Telephone Props. | 14/– | 12/9 | 5 | 6 | 13/9 | — | 8 14 6 |
| Telephone Rentals (5/–) | 10/– | 6/3 | 10 | 10 | 8/3 | +3d. | 6 1 3 |
| Western Union | 40½ | 19½ | 2½ | — | 32½ | — | — |
| **Traction and Transport** | | | | | | | |
| Anglo-Arg. Trams: | | | | | | | |
| First Pref. (£5) | 7/6 | 3/6 | Nil | Nil | 5/– | — | — |
| 4% Inc. | 16 | 5 | Nil | Nil | 9 | — | — |
| British Electric Traction: | | | | | | | |
| Def. Ord. | 950 | 500 | 5 | 5 | 675 | −25 | — |
| Pref. Ord. | 164 | 115 | 8 | 8 | 155 | +10 | 5 3 4 |
| Bristol Trams | 52/6 | 35/– | 8 | 10 | 42/6 | — | 4 14 1 |
| Brazil Traction | 13 | 6½ | $1 | 50c. | 10½ | −⅜ | — |
| Calcutta Trams | 25/6 | 20/9 | 8 | 8 | 23/– | — | 6 19 2 |
| Cape Elec. Trams | 18/– | 16/9 | 5 | 5 | 17/– | — | 5 17 8 |
| Lancs Transport | 37/9 | 27/6 | 10 | 10 | 30/– | — | 6 13 4 |
| Mexican Light: | | | | | | | |
| 1st Bonds | 35 | 20 | 5 | 5 | 35 | — | — |
| Rio 5% Bonds | 82 | 47 | 5 | 5 | 80 | — | 6 5 0 |
| Southern Rly.: | | | | | | | |
| 5% Prefd. | 75½ | 48 | 5 | 5 | 65 | −1½ | 7 13 10 |
| 5% Pref. | 99½ | 79 | 5 | 5 | 93 | +3 | 5 7 6 |
| T. Tilling | 2½ | 32/6 | 10 | 10 | 38/9 | −⅛ | 5 3 3 |
| Tilling & B.A. | 54/6 | 43/9 | 10 | 9* | 45/– | — | 4 2 3 |
| West Riding | 37/9 | 30/– | 10 | 10 | 28/9 | −⅛ | — |
| **Equipment and Manufacturing** | | | | | | | |
| Aron Electricity Ord. | 32/3 | 22/6 | 15 | 15 | 22/6 | — | — |
| Assoc. Elec.: | | | | | | | |
| Ord. | 45/3 | 30/– | 10 | 10 | 38/3 | – | 5 4 9 |
| Pref. | 36/6 | 30/– | 8 | 8 | 32/6 | — | 4 18 6 |
| Automatic Telephone & El. | 48/9 | 37/– | 10 | 12½ | 42/6 | — | 5 17 8 |
| Babcock & Wilcox | 48/– | 37/– | 10 | 12½ | 43/9 | +½ | 5 14 2 |
| British Aluminium Ord. | 61/3 | 48/– | 12½ | 12½ | 50/– | — | 5 0 0 |
| British Insulated Ord. | 88/– | 70/3 | 20 | 20 | 80/– | — | 5 0 0 |
| British Thermostat (5/–) | 16/– | 11/6 | 18½ | 18½ | 12/6 | — | 7 8 0 |
| British Vacuum Cleaner (5/–) | 22/6 | 8/– | 40 | 12½ | 10/– | — | 6 5 0 |
| Brush Ord. | 5/9 | 2/6 | Nil | Nil | 4/– | — | — |
| Callender's | 92/– | 50/– | 20 | 15 | 60/– | — | 5 0 0 |
| Chloride Elec. Storage | 82/– | 62/– | 20 | 15 | 3½ | — | 4 5 9 |
| Consolidated Signal | 96/– | 60/– | 36½ | 36½ | 60/– | −5 | 12 3 4 |
| Crabtree (10/–) | 25/6 | 16/6 | 17½ | 17½ | 21/3 | — | 8 4 9 |
| Crompton Parkinson: | | | | | | | |
| Ord. (5/–) | 21/– | 12/6 | 15 | 20 | 17/6 | — | 5 14 3 |
| E. K. Cole (5/–) | 9/– | 2/6 | 10 | Nil | 4/9 | +3d. | — |
| Elec. & Musical Industries (10/–) | 14/9 | 6/6 | 5 | Nil | 9/9 | +2/– | — |
| Electric Construction | 40/6 | 28/– | 12½ | 13½ | 33/9 | — | 8 0 0 |
| Enfield Cable Ord. | 58/– | 37/6 | 25 | 16½ | 47/6 | — | 6 16 10 |
| Electrical Switchgear (10/–) | 27/– | 23/– | 16 | 10 | 21/3 | — | 4 14 3 |
| English Electric | 36/6 | 25/– | 10 | 10 | 30/– | −⅛ | 6 13 4 |
| Ensign Lamps (5/–) | 16/9 | 13/9 | 25 | 25 | 15/– | — | 8 6 8 |
| Ericsson Tel. (5/–) | 43/– | 32/3 | 25* | 25* | 35/– | — | 3 11 5 |
| Ever Ready (5/–) | 26/6 | 16/9 | 35 | 30 | 27/– | +6d. | 5 11 2 |
| Falk Stadelmann | 27/– | 18/– | 10 | 6 | 18/9 | — | 6 13 4 |
| Ferranti Pref. | 25/6 | 21/– | 7 | 7 | 21/3 | — | 6 11 9 |
| G.E.C.: | | | | | | | |
| Pref. | 32/9 | 25/– | 6½ | 6½ | 27/6 | — | 4 14 6 |
| Ord. | 82/– | 61/– | 17½ | 20 | 75/– | — | 5 4 4 |
| Greenwood & Batley | 29/– | 20/– | 7 | 15 | 22/6 | — | 13 6 8 |
| Hall Telephone (10/–) | 22/3 | 17/– | 15 | 15 | 18/9 | — | 8 0 0 |
| Henley's (5/–) | 21/– | 13/9 | 20 | 20 | 17/6 | — | 5 14 3 |
| 4½% Pref. | 23/– | 18/– | 4½ | 4½ | 18/9 | — | 4 16 0 |
| Hopkinsons | 46/9 | 37/– | 12½ | 15 | 42/6 | — | 7 1 0 |
| India-Rubber Pref. | 22/– | 17/9 | 5½ | 5½ | 20/– | — | 5 10 0 |
| Intl. Combustion | 121/3 | 97/– | 32½ | 32½ | 5½ | — | 5 13 0 |
| J. Lucas | 61/– | 42/6 | 15 | 15 | 56/3 | — | 5 6 9 |
| Johnson & Phillips | 42/6 | 32/– | 12½ | 12½ | 42/6 | — | 5 17 8 |
| Lancashire Dynamo | 72/– | 50/– | 25 | 25 | 56/3 | +⅛ | 8 18 0 |
| Laurence Scott (5/–) | 12/– | 8/6 | 15 | 15 | 9/6 | — | 7 18 4 |
| London Elec. Wire | 31/6 | 25/– | 12 | 7½ | 26/3 | — | 5 14 4 |
| Mather & Platt | 50/3 | 37/6 | 13½ | 13½ | 45/– | — | 6 0 0 |
| Metropolitan Elec. Cable Pf. | 21/3 | 21/– | 5½ | 5½ | 21/3 | — | 5 3 0 |
| Murex | 85/9 | 63/9 | 20 | 20 | 82/6 | +½ | 4 16 10 |
| Pye Deferred (5/–) | 11/6 | 7/– | 25 | 25 | 7/6 | — | 16 13 4 |
| Revo (10/–) | 35/6 | 22/– | 17½ | 17½ | 21/3 | — | 8 4 9 |
| Reyrolle | 61/– | 52/– | 12½ | 12½ | 60/– | — | 4 3 4 |
| Siemens Ord. | 26/9 | 17/– | 7½ | 7½ | 20/– | — | 7 10 0 |
| Strand Elec. (5/–) | 5/6 | 1/3 | 10 | 4 | 2/– | — | 8 0 0 |
| S. Smith (1/–) | 9/6 | 5/6 | 37½ | 50 | 7/6 | — | 6 13 4 |
| Switchgear & Cowans (5/–) | 15/– | 9/6 | 20 | 20 | 11/3 | — | 8 18 0 |
| Telegraph Condenser (10/–) | 7/6 | 5/– | 5 | — | 7/6 | — | — |
| Telegraph Construction | 2½ | 27/6 | 10 | 10 | 32/6 | — | 6 3 1 |
| Telephone Mfg. (5/–) | 10/– | 7/– | 9 | 9 | 8/– | — | 5 12 6 |
| Tube Investments | 91/6 | 68/– | 23½ | 23½ | 89/6 | +9d. | 5 7 0 |
| Vactric (5/–) | 4/3 | 2/– | 4 | Nil | 2/6 | — | — |
| Vickers (10/–) | 24/6 | 14/6 | 10 | 10 | 18/6 | +2/– | 5 8 1 |
| Ward & Goldstone (5/–) | 22/6 | 19/6 | 20 | 20 | 19/9 | — | 5 1 3 |
| Westinghouse Brake | 54/9 | 38/– | 17½ | 17½ | 2½ | −½ | 8 4 9 |
| Walsall Conduits (4/–) | 31/9 | 21/3 | 55 | 55 | 25/– | — | 8 16 0 |
| est, Allen (5/–) | 7/6 | 5/– | 7½ | 10 | 5/9 | — | 8 14 0 |

* Dividends are paid free of Income Tax.

# CONTRACT INFORMATION

## Particulars of work for which tenders are invited, contracts placed, and building schemes promising work for electrical contractors and traders

## Contracts Open

*Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses. Further details of items marked with an asterisk can be obtained from the Department of Overseas Trade (Inquiry Room), Great George Street, London, S.W.1.*

**Birmingham.**—February 9th. Electric Supply Department. Three electrically driven pumps. (See this issue.)

**Cardiff.**—February 5th. Electricity Department. E.h.v. sub-station switchgear and e.h.v. and l.v. paper insulated cables for one year. (See this issue.)

**Iran.**—TEHRAN.—March 1st. Ministry of Industry and Mines. Machinery for a cane sugar factory. (T. 23403/39.)*

**Leeds.**—City Council. Maintenance and repair work, including electrical work, for the six months ending September 30th at several housing estates, Plans by R. A. H. Livett, housing director.

**London.**—BATTERSEA. — February 14th. Electricity Department. Electrical materials for one year from April 1st. (January 5th.)

**Manchester.**—January 12th. Electricity Department. Domestic cookers for twelve months. (January 5th.)

January 18th. Supply, delivery and erection at the central control room and various sub-stations of batteries and charging equipments. (December 29th.)

Electricity Committee. January 18th. Conversion of two passenger lifts from DC to AC. H. C. Lamb, chief engineer and manager, Electricity Department, Town Hall, Manchester, 2.

**New Zealand.** — WELLINGTON.—Public Works Department. February 6th. Two motor driven centrifugal pumps. (T. 29120/39.)*

February 13th. Three single-phase transformer units. (T. 28146/39.)* Two 2,250-kVA three-phase boosting transformers. (T. 28144/39.)* Remote control equipment. (T. 28791/39.)*

February 20th. Seven single-phase transformer units. (T. 28148/39.)* Four single-phase transformer units. (T. 28147/39.)*

February 27th. 22-kV switchgear. (T. 28858/39.)* 11-kV switchgear. (T. 28789/39.)*

March 12th. 110-kV outdoor switchgear and steelwork. (T. 28145/39.)*

March 26th. Four single-phase transformer units. (T. 28143/39.)*

March 5th. Cables. (T. 30431/39.)*

March 19th. Switchgear and steelwork. (T. 30384/39.)*

April 2nd. Switchgear and steelwork. (T. 30385/39.)*

**South Africa.**—DURBAN.—January 19th. General Stores Department. Electrically driven trenching machine. (T.Y. 29779/39.)* Overhead frogs and insulated crossing, &c. (T. 29780/39.)* Porcelain insulators. (T. 30183/39.)*

February 2nd. 6,600-V switchgear. (T. 29782/39.)

SALISBURY (S. RHODESIA).—April 15th. Municipality. Cables. (T. 30438/39.)*

PRETORIA.—February 1st. Union Tender and Supplies Board. Electric passenger lift. (T. 30414/39.)*

**Sunderland.** — January 12th. Four feeder switch-houses, and two generator switch-houses; borough electrical engineer, Electricity Offices, Dunning Street (deposit £2).

**Sutton and Cheam.**—January 26th. Electric lighting in public shelters, and constant potential battery charger, for Corporation; N. H. Mitchell, borough engineer, High Street, Sutton, Surrey (deposit £2 2s.).

**Wolverhampton.**—January 15th. Electrical Engineer's Department. E.h.v. switchgear. (December 15th.)

## Orders Placed

**Birkenhead.**—Assistance Committee. Accepted. Electric time recording clock (£37).—Gledhill-Brook Time Recorders. Wireless installation at institution.—Ryalls & Jones.

**Blackburn.**—Town Council. Accepted. Reconstructed truck-type switchgear for a sub-station in Harley Street, Great Harwood.—Ferguson, Pailin.

**Blackpool.** — Electricity Committee. Accepted. Four 300-kVA and two 150-kVA transformers.—Lindley Thompson Transformer & Service Co.

Housing Committee. Accepted. Electrical installation at houses on the Mather Street estate.—J. W. Fielding & Co.

**Bradford.**—Electricity Committee. Recommended. Ash sluicing plant.—International Combustion. Water softening plant.—Paterson Engineering Co.

**Cardiff.**—Transport Committee. Accepted. Overhead line equipment (£11,721).—Clough, Smith & Co. Ten trolley-bus chassis (£14,335). — Leyland Motors.

**Chesterfield.** — Gas Committee. Accepted. Second-hand electric generator set (£250).—J. W. Ellis & Co.

**Glasgow.** — Police Committee. Accepted. 400 electric torches and batteries required from time to time.—Finnie & Co.

Transport Committee. Accepted. Cable.—Scottish Cables.

Housing Committee. Accepted. 144 electric wash-boilers (£478).—British Electrical Manufacturing Co.

Cleansing Committee. Accepted. Two new turbine diaphragms for Govan refuse power works (£184).—G.E.C.

**Hastings.**—Electricity Committee. Accepted. Pilot cables (£200).—Pyrotenax.

**Leeds.**—Health Committee. Accepted. Installation of six electric fans at Killingbeck Hospital (£55).—Sun Electrical Co.

Electricity Committee. Accepted. Switchgear for Whitehall Road Works (£10,243).—Yorkshire Switchgear & Engineering Co.

**London.** — SOUTHWARK. — Electricity Committee. Recommended. Cables for twelve months.—Aberdare Cables; Scottish Cables.

**Manchester.** — Electricity Committee. Accepted. Cable.—Callender's Cable & Construction Co. Passenger and goods lifts in connection with change over of supply.—Etchells. Congdon & Muir; Waygood-Otis. Fan motors for twelve months.—G.E.C.; Keith Blackman.

Transport Committee. Accepted. Metal rectifier charging equipment for motor buses.—Oldham & Son.

**Plymouth.**—Electricity Committee. Accepted. Circulating water screening plant for Prince Rock power station (£1,384).—F. W. Brackett & Co. Ash handling plant (£8,418).—John Thompson.

**Portsmouth.**—Electricity Committee. Accepted for six months' extension. Cable.—Aberdare Cables, Ltd., and Scottish Cables, Ltd., at 5 per cent. increase.

**Wakefield.**—Baths Committee. Accepted. Switchgear and wiring (£30).—H. Smith.

*(Continued on next page.)*

## Financial Section (*Concluded from page 54*)

**Bankruptcy Proceedings—contd.**

with net assets of £80, leaving a deficiency of £573. The debtor ascribed his failure to loss as guarantor of hire-purchase agreements in consequent of customers defaulting, loss of trade through customers leaving the neighbourhood, loss of agencies for wireless manufacturers, competition, losses on contracts, and decline in turnover since the crisis of September, 1938. The case being a summary one was left in the hands of the Official Receiver as trustee.

**D. B. Jones,** 1, Tireithin, Llwynhenry, Llanelly, electrical contractor.—The receiving order was made on the debtor's petition, and at the first meeting of creditors held recently at Carmarthen, the case, being a summary one, was left in the hands of the Official Receiver as trustee.

**T. W. Dennison** (T. W. Dennison & Co.), electrical and radio engineer, 40, Thornton Road, Bradford.—Public examination January 24th, at the County Court, Bradford.

**J. O. D. James** (James and Whiting), electrician, 102, Chepstow Road, Newport, Mon.—Public examination February 13th, at the Law Courts, Newport.

**W. N. Bishop,** electrical engineer, 39, College Avenue, Maidenhead.—Receiving order made December 30th on debtor's own petition.

**R. J. Horton,** electrical engineer, 204, Coldharbour Lane, Brixton, London.—First and final dividend of 1s. 7½d. in the £, payable January 16th at 185-188, High Holborn, London, W.C.1.

## Reports and Dividends

**Turner & Newall, Ltd.,** report a net profit for the year to September 30th of £960,615, as compared with £1,277,694 for the preceding year. The final ordinary dividend is 11¼ per cent., making 15 per cent. for the year (against 20 per cent.), the welfare trust receives £10,000, and general reserve £100,000. The balance carried forward is £66,763 (against £116,610 brought in).

**East India Tramways** is paying a final dividend of 4 per cent. (against 5 per cent.), tax free, making 8 per cent. for the year (against 9 per cent.).

**The Quebec Power Co.** is paying an interim dividend of 25 cents for the quarter to December 31st.

**Sterling Cable Co.**—A. C. Cossor, Ltd., have acquired the whole of the share capital of the company.

**R. B. Pullin & Co.** have declared a final dividend of 20 per cent., making 25 per cent. for the year ended October 31st. The total distribution is the same as for the preceding year, but is paid on £30,000 more capital.

## Forthcoming Events

**Junior Institution of Engineers.**—Friday, January 12th. 39, Victoria Street, S.W.1. 6.30 p.m. "The Engineer and Salesmanship," by Mr. R. Gillespie Williams.

**Institution of Electrical Engineers.**—WESTERN CENTRE. — Monday, January 15th. South Wales Institute of Engineers, Cardiff. 3 p.m. "Electrically Manufactured Steels," by Mr. H. A. Sieveking.

**Association of Supervising Electrical Engineers.** — Tuesday, January 16th. Lighting Service Bureau, London. 6.30 p.m. "The Development of Sound Equipment," by Mr. D. T. Bennett.

**Royal Society of Arts.**—January 17th. John Street, Adelphi, W.C. 2.30 p.m. "Application of X-ray Technique to Industrial Problems," by Mr. H. P. Rooksby.

**Leeds Electrical Club.** — Thursday, January 18th. Parkway Hotel, Lawnswood, Leeds. 7.15 p.m. Members' dinner.

**Institution of Mechanical Engineers.**—Friday, January 19th. Storey's Gate, London. 3 p.m. Thomas Hawkley Lecture. "A Review of Forty Years' Development in Mechanical Engineering Plant for Power Stations," by Sir Leonard Pearce.

# Contracts in Prospect

*Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.*

**Aylesbury.**—Fire station, The Lawns, Brill, for T.C.; borough surveyor.

**Berkhamsted.** — Workshop and store, Nettleden Road, Little Gaddesden; N. Sinclair.

Houses, Lyme Avenue, Northchurch; S. Gilbert.

**Bingley.**—New works for G. Greenwood & Son, Queensbury.

**Birmingham.**—Works extensions at old tram depôt, Holyhead Road; Fletcher Bros., Ltd., Eagle Works, Handsworth.

Housewifery centre, King's Road, New Oscott; city engineer.

Bank, Alcester Road, Mill Pool Hill estate; city engineer.

Depôt, Mill Pool Hill estate; city engineer.

**Blackhill** (COUNTY DURHAM).—Senior school, Bridgehill estate, for R.C. Authorities.

**Bradford.**—New factory for A. Reddell & Cop, East Parade; H. Dawson, architect, Clydesdale, Ashfield Avenue, Frizinghall. J. J. Obank, contractors, Town Lane, Idle.

**Brandon** (NEAR DURHAM).—A.R.P. shelters (17) to hold 50 people each; J P. Addison, Urban Council Offices, Brandon.

**Brentford and Chiswick.** — Schools, Brentford, for B.C.; L. A. Cooper, architect, Town Hall, Chiswick, W.4.

**Chesterfield.** — Estate development, Hasland Road; Midland Estates, Ltd.

**Chorley.**—New factory in Hornby Road for Lancashire Concrete Products, Ltd., Blackburn Road.

**Colwyn Bay.**—A.R.P. and equipment stations, Rhiw Road, for T.C.; borough surveyor.

**Crewe.**—Senior school, Buchan Grove, for E.C.; borough surveyor.

**Dagenham.**—Extensions to factory for Windsor Hosiery Co., Oxlow Lane.

**Dartford.**—New works for Baldwin Instrument Co., Brooklands.

**Derby.** — Engineering workshop at technical college, for E.C. (£42,293); city surveyor.

**Dudley.**—Extensions to works for Walker Bros., Netherton.

**Dundee.** — Premises, Constitution Street, for Scottish Co-operative Wholesale Society, Ltd.

**Eccles.**—Boiler house, Monton Fields Road; Edward Taylor, Ltd.

**Eire.**—DUBLIN.—Shelters (£80,000), for T.C.; H. T. O'Rourke, architect, City Hall.

Houses, West Cabra, and flats and cottages, Newfoundland Street, Cook Street, Railway Street and Emmet Road, for T.C.; borough surveyor.

**Enfield.**—Works additions, Stockingswater Lane; H. St. G. Robinson & Son, engineering contractors, Palace Chambers, Sydney Road, Enfield.

**Essex.**—South Benfleet senior school (£41,319), and Essex institute of agriculture (£12,420), for C.C.; county architect, Chelmsford.

**Evesham.**—Pumping station, &c., for T.C.; J. Abbott, borough engineer, Municipal Offices, Evesham.

**Felling** (Co. DURHAM).—Houses at Holly Hill; H. Fawcett, U.D.C. surveyor.

**Godstone.** — Cubicle accommodation, Bletchingley Hospital, for Joint Hospital Board; F. W. Walpole, secretary.

**Hastings.**—Infant and junior school, Hollington, for E.C.; borough surveyor.

Shops, Westfield Lane; Coghurst Estates, Ltd.

**Hatfield.**—Fire station, warden's post and first aid point, Cuffley; R.D.C. surveyor.

**Hereford.**—Erection of assembly hall, Hoarwithy Street, for Board of Management of Y.M.C.A.; Jewell & Sons, contractors, Hereford.

**Ilkeston.**—Depôt extension, Carr Close (£2,500); borough engineer.

**Jarrow.**—Conversion of post office in Ellison Street into A.R.P. report centre for the T.C.; J. N. Black, Ltd., builders, Grange Road, Jarrow.

**Kent.**—Eight workshops and two stores, Fort Pitt, for E.C.; county architect, Springfield, Maidstone.

**Lancashire.** — Senior St. Aloysius School, Roby, for E.C.; county architect, County Offices, Preston.

**Leeds.**—Three-storey factory and workshop for Styring Trust, Ltd.; H. Jackman, architect, South Parade, Leeds.

**Leigh.**—Air raid shelters (£6,404), for E.C.; borough surveyor.

**Lleyn** (CAERNARVON).—Houses, Nevin, Caernarvonshire, for the R.D.C.; J. Williams, contractor, Nevin, Caernarvon.

**Merton and Morden.**—Nine surface shelters (200 persons each), for U.D.C.; surveyor, Council Offices, Kingston Road, Merton, S.W.19.

**Newcastle-on-Tyne.**—A.F.S. headquarters in Pilgrim Street for the City Council; J. T. Main, builder, Elswick Road, Newcastle-on-Tyne.

A.R.P. shelters at Municipal College of Medicine, Kenton Training College, Rutherford College (£3,600); F. Harvey, architect, Education Offices, Northumberland Road, Newcastle.

**Northants.**—Health centres at Rushden Moor Road, Rothwell, and Rock Street, Wellingborough; G. H. Lewin, county architect, County Hall, Northampton.

**Northern Ireland.** — LARNE. — Presbyterian church, Greenisland; Gamble and Maxwell, architects, 35, Royal Avenue, Belfast.

**Nuneaton.** — Rebuilding premises, Abbey Street; J. Hepworth & Son, Ltd.

**Old Colwick.**—Parish church (£6,300), for Rev. W. S. Hildesley, rector; C. E. Howitt, architect, Nottingham.

**Plymouth.**—Grain silos, West Wharf; Spillers & Co., Ltd.

**Rotherham.** — A.R.P. at elementary schools and Girls' High School (£35,117), for E.C.; borough surveyor.

**Rugby.**—Additions, Lodge Plug Works.

**Salford.** — Schools, Broughton, and Light Oaks, Pendleton, for E.C.; borough surveyor.

**Sheffield.** — Council school, Lindsay Road (£33,050); W. G. Davies, city architect, Town Hall, Sheffield.

Houses, new street off Springfield Road; A. G. Redmile, 95, Cobnar Road.

**South Shields.**—Rebuilding of cottages, Broughton Road, for the Master Mariners' Annuity Society; Page, Son and Bradbury, architects, 75, King Street, South Shields.

Shopping centre (£3,000), Little Horsley Hill estate, for the T.C.; borough engineer.

**Southwell.**—Fire station, Edwinstowe; R.D.C. surveyor.

**Staffordshire.**—Clinic, Portobello estate, Willenhall, for E.C.; K. L. Murray, county architect, County Buildings, Stafford.

**Stanley** (YORKS).—Houses at Newton Hill, for S. H. B. Gill.

**Stirling.**—Senior and junior building, Kilsyth Academy, for County E.C. (£30,000); county architect, Viewforth, Stirling.

**Stockton-on-Tees.** — Air-raid shelters (£18,225); A. S. Knowles, Town Hall, Stockton-on-Tees.

**Stourbridge.**—Extensions, gymnasium, &c., King Edward VI School, for governors; T. W. Watson, headmaster.

**Teddington.**—Garages and offices, Lensbury Club, Broom Road; Asiatic Petroleum Co., Ltd.

Additions, 129, Fulwell Road; Northcote Photo Works, Ltd.

**Tendring.**—Fire station, Parkestone, for R.D.C.; Surveyor's Department, Weeley House, Weeley.

**Timperley.**—New cinema (£30,000), Park Road, for Warwick Cinemas (Timperley), Ltd., 14, St. Ann's Square, Manchester.

**Torquay.**—Sunday school, Starpitten Lane; Baptist trustees.

Houses (28), Barewell Road; Dymond & Tosswill.

**Twickenham.**—Extensions, 8, Waldegrave Park; Eagle Oil and Shipping Co., Ltd.

Extensions, Crimony Works, Heath Road; Corney Newman, architect, 32, Walbrook, E.C.4.

**Wakefield.**—Warehouse, Henry Street; J. C. Waterhouse, Ltd.

**Wallasey.**—Shops, Liscard Road; Montague Burton, Ltd.

**Warlingham** (SURREY).—Houses (80), Mayes Place; T. G. Ryall & Son.

**West Hartlepool.**—Public shelter, Park Road; borough engineer.

**Widnes.**—A.R.P. at twelve schools (£5,000), for E.C.; borough surveyor.

**Wisbech.**—Extensions to hospital for Joint Hospital Board (£4,000).

**Worthing.**—Elementary schools shelters, &c. (£11,000), for T.C.; T. E. Harvey, architect, Town Hall, Chapel Road.

Shops and flats, Mulberry Lane; Onslow Estates (Worthing), Ltd.

Houses, Chesham Close; E. W. Owen.

# Electrolytic Solutions

THE physical properties of non-aqueous solutions of electrolytes are discussed in *Science* by Prof. C. A. Kraus, of Brown University, who is the president of the American Chemical Society. It is pointed out that the solubility of ordinary inorganic salts is chiefly determined by the chemical nature rather than by the physical properties of the solvent medium. The dielectric constant of the solvent is of secondary importance as a determining factor of the solubility in the case of ordinary inorganic salts, many of which, for example, are readily soluble in ethylamine, whose dielectric constant is 6.2, while there are few, if any, that are readily soluble in nitro-benzene, whose dielectric constant is 35.

The properties of solutions of typical strong electrolytes are little influenced by the chemical nature of the medium in which they are dissolved; they are chiefly, and very generally, determined by the dielectric constant of the solvent. In a solvent of high dielectric constant, electrolytes are completely dissociated into their ions. In solvents of somewhat lower dielectric constant, short-range ion interaction occurs and an equilibrium exists between simple ions and ion pairs; in solvents of still lower dielectric constant, ions and ion pairs associate to form triple ions. In solvents of very low dielectric constant, association becomes extremely complex at higher concentrations, leading to very complex relations between the concentration and the various physical properties of the solutions.

The association of ion with ion depends, in the first place, upon the size of the ions. It also depends upon the geometrical structure of the ions and the distribution of charge among the various atoms of this structure.

Where interactions other than coulombic occur between the ions or where special interactions occur between the ions and the solvent molecules, the properties of solutions depend upon the nature of the solvent medium. Certain acids, for example, are strong electrolytes in water but are very weak or non-electrolytes, in nitro-benzene. In the case of nearly all the weak electrolytes, interactions other than coulombic are present and the properties of their solutions are dependent upon the nature of the solvent medium as well as upon its dielectric constant.